## *An Investigation into the Impact of Formative Feedback on the Student Learning Experience*

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# An Investigation into the Impact of Formative Feedback on the Student Learning Experience

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This thesis is submitted in partial fulfilment of the requirements for the degree of Doctor of Education.

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**Declaration**

This thesis was completed as part of the Doctorate in Education programme.



This thesis results entirely from my own work and has not been offered previously for any other degree or diploma

**Signature**

**Date November 2010**

**Abstract**

In recent years there have been a number of indications that there are issues with the provision of feedback to students in Higher Education, for example the National Student Surveys, 2005 – 2008 QAA Institutional Audit Reports showed low levels of satisfaction with the feedback that students received. .

The aim of the research undertaken in this thesis was to explore the issues with feedback from the point of view of students, academics and institutions and to determine whether the provision of feedback to students in an Institute of Higher Education enhances the learning experience of those students, addressing the research question - *can formative feedback enhance student achievement ?*

The purpose in carrying out the research in this thesis is to use the results from the research to inform and improve teaching practice in order to enhance student learning opportunities. The work is important for students, staff, and institutions.

The research evidence from the literature suggests that “assessment for learning” and the provision of formative feedback enhances the student learning experience. The “assessment for learning” (AfL) approach is currently widely advocated in Higher Education. However, the quantitative data gathered for this thesis suggests the impact of the AfL approach is not as positive as is suggested by the AfL advocates.

The evidence in this thesis indicates that despite the provision of feedback to students there is little indication that the student learning experience improves as a result. The quantitative analysis in this thesis compared student groups, over a three year period, who had experience of formative feedback and student groups who had not. The results, based on the summative assessment performance of the student groups, suggest despite the development of formative interventions and detailed formative feedback being provided to students there was little or no correlation between the provision of feedback and the enhancement of student learning.

The qualitative findings from this thesis, based on pilot studies on the types of feedback students want and a series of focus groups, suggest that students want and expect feedback. They want feedback that they can understand and that they can use in their learning. However there are issues in the type of feedback that is given to students.

The qualitative data indicates that there is a difference in perception between students and academic staff on what constitutes effective feedback. The difference is mainly around the understanding of the language used in the feedback but also the expectations of what to do with the feedback. Academics expect students to use the feedback in feedforward for future learning, but students are unsure as to what they should be doing with the feedback.

The data gathered in this thesis suggests that students want to use feedback to enhance their generic academic skills rather than to “close the gap” on their subject knowledge and understanding. This finding conflicts with current AfL literature; conjectures about the discrepancy are explored.

If formative feedback is to “close the gap” on student understanding students need to be encouraged to engage with the feedback and guided in how use the feedback to enhance their learning. For feedback to be valued by students the feedback needs to be high quality and be understandable. The findings from the case studies are used to make recommendations for changes in academic practice in the provision of feedback.

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# Chapter 1 Introduction – Feedback and the Student Experience

## 1.1 Introduction

The Higher Education sector in the UK is moving towards greater accountability. The public spending review, the changes to the university funding model and the increase in student fees all contribute to the growth in accountability. Alongside this change in environment is the growth in student voice, evidenced by the importance placed on student surveys such as the National Student Survey. One of the strongest messages coming from the student voice is the dissatisfaction with the feedback on assessment. Assessment for Learning as a "movement" has been discussed in the secondary school environment and in Higher Education but there is little evidence to suggest that the main findings from "assessment for learning" have been implemented widely or properly. This thesis seeks to examine the nature of feedback provided to students and the impact that feedback can have on student achievement and student learning when it is implemented in a Higher Education setting. The findings from this thesis will be used to inform the literature and to make local improvements in practice.

The purpose of this Ed D thesis is to examine the impact of formative feedback on student learning and student achievement. The objective in undertaking the thesis was to extend the author's understanding of their profession through research, evaluation and critical reflection on their practice, with particular attention to assessment and feedback.

Assessment is an important part of the student experience and feedback is an important part of assessment. For a number of years the provision of feedback to students has been recognised as a crucial aspect of learning in Higher Education and many commentators on assessment suggest that feedback is one of the main interventions by which student learning can be improved. The problem is, and the main justification for this thesis, is that there is evidence to suggest that the quality of feedback given to students is very varied. This thesis seeks to reflect on the author's professional practice in the provision of feedback, explore the problems associated with feedback, and investigate ways in which formative feedback and formative assessment can be changed in order to improve the student learning experience and levels of student achievement.

Feedback is an issue that has raised concern in the National Student Surveys in 2005, 2006, 2007 and 2008 in particular in terms of timeliness and quality of feedback. The QAA summary of Institutional Audit Reports (2006) indicates that whilst there is a great deal of good practice in the

provision of feedback to students there are significant issues in the timeliness, consistency and quality of the feedback in many Higher Education institutions. The concerns raised regarding feedback are all the more worrying given the importance of feedback in pedagogic theory, summarised by Laurillard (2002:61) with the suggestion that "action without feedback is completely unproductive for the learner". This thesis seeks to examine the nature of the feedback and ways in which students utilise formative feedback (on both formative and summative assessment) and determine the impact of feedback on student learning and student achievement. The thesis looks at the impact of formative feedback on the achievement in subsequent summative assessment.

Hattie's (1992) synthesis of 134 meta-analyses of the possible influences on achievement indicated that feedback was amongst the most powerful influences on student achievement. There is a large amount of literature on assessment – incorporating behaviourist, cognitive, constructivist, socio cultural (situative) and post-modern approaches to education. Irrespective of the perspective of learning which is adopted, feedback has a central role to play for the learner. Much of the literature on assessment focuses on summative assessment but there is also a large body of literature centred on formative feedback and on formative assessment. Brown (2001) suggests that "assessment defines what students regard as important, how they spend their time and how they come to see themselves as individuals". Wiliam (2008) suggests that because assessment acts as the bridge between teaching and learning it is the central process of teaching. Gibbs and Simpson (2004) suggest that "assessment is seen to exert a profound influence on student learning: on what students focus their attention on, on how much they study, on their quality of engagement with learning tasks, and, through feedback, on their understanding and future learning". Student learning is influenced by a whole range of processes and activities one of which is feedback. The literature on feedback suggests that students value feedback (Hartley, Skelton and Higgens, 2002; Weaver, 2006) but also that not all feedback is perceived as useful by students (Black and Wiliam, 1998, Hounsell, Hounsell, Litjens and McCune, 2005). In some situations students become confused because feedback can raise more questions than it answers (Lillis and Turner, 2001). The issues raised by these authors will be returned to and discussed in detail in chapter 3. Askew and Lodge (2000) suggest that feedback in education is a complicated process and raises the concern that the complex nature of feedback is rarely explored in appropriate depth. In this thesis the author seeks to identify and analyse the complexities surrounding feedback in Higher Education.

The importance of feedback in the assessment process is indicated in the QAA Code of Practice on Assessment (2000) where it is stated that it is incumbent on HE institutions to "ensure that appropriate feedback is provided to students on assessed working in a way that promotes learning and facilitates improvement". In section 4.1 of the 2003 White Paper on Higher Education it is suggested that "all students are entitled to be taught well and to be given the support they need to

learn effectively". The subjects of the case studies in this thesis are situated in the Computing subject benchmark area and the importance of feedback in computing is contextualised in the benchmark statement indicating that students should "receive appropriate and timely feedback on all work and this includes constructive feedback on coursework and project work" (QAA, 2007:8).

The importance of feedback to student learning is suggested by Chickering and Gamson (1991:16) in their discussion on the principles of good practice in higher education and supported by Weaver (2006:382) who argues that feedback can "assist in student learning". The argument on the importance of feedback to student learning is further emphasised in Hattie (1987), Black and Wiliam (1998), Gipps and Stobart (2003), Gibbs and Simpson, (2004), Nicol and Macfarlane-Dick (2004, 2006), Hounsell, Hounsell, Litjens and McCune (2005), and Nicol and Milligan (2006). In Inside the Black Box, Black and Wiliam (1998:1) claim that their study on formative assessment provides "firm evidence that indicates clearly a direction for change which could improve standards of learning", they go on to make a plea that "national policy will grasp this opportunity and give a lead in this direction". However, the claims made by the advocates of formative feedback are contested by the other authors, for example Smith and Gorard (2005). In their study Smith and Gorard (2005) found that the provision of formative feedback potentially had an adverse impact on learning outcomes. On the other hand Smith and Gorard's work was criticised because the difference between the control groups and the treatment groups was the omission of grade marks rather than a difference in the provision of formative feedback. The lack of consensus indicates that the impact of formative feedback is not particularly well understood. It is hoped that the findings of this thesis will contribute to the general debate on the effectiveness of "Assessment for Learning".

Whilst this thesis makes no claims as to influence national policy it is hoped that the reflection on the author's practice and the results from that reflection will be generalised and rolled out across the author's own department and institution. The findings of this thesis will be shared with the Computer Science community via the Higher Education Academy subject centre for Information and Communication Science, the Council and Heads of Computing's (CPHC) Learning Development Group and through presentations at conferences such as the Frontiers in Education Conference, ITiCSE and Informatics Education Europe.

A number of studies show that students appreciate and want good feedback (Hyland 2000; O'Donovan, Price and Rust 2000; Higgins and Hartley 2002) but there are many indicators which suggest that they are not satisfied with the feedback (or lack of feedback) that they receive. The National Student Survey results (2005 – 2008) show that students are not satisfied with the amount of formative feedback they get, and what they do get is not helping them as much as it could do.

The literature on feedback suggests that formative feedback is potentially a powerful and potentially a constructive learning tool although there are counter claims such as in Crisp (2007:571) who argues that “providing feedback alone is not sufficient to effect higher standards of work by students”, Crisp goes on to assert that there is only limited evidence to suggest that students respond to feedback by making changes to their learning or understanding or future study which are consistent with the intent of the feedback received. The hypothesis in this thesis is that formative feedback can make a difference to student achievement and can enhance the student learning experience. The study examines groups of students who have had different levels of formative feedback and compares their levels of student achievement and their perceptions of the ways in which feedback has had an impact on their learning experience.

The provision of feedback is a significant challenge facing educators. There are many aspects associated with the challenge of providing timely and quality feedback for students in order for students to derive the greatest benefit to their learning from that feedback. Feedback is a key aspect in assessment and is fundamental in enabling students to learn from assessment, (Hattie, 1987, Stefani, 1998, Sadler 1998, Black and Wiliam,1999, Pellegrino, Chudowsky and Glaser 2001, Yorke, 2003). Formative feedback can be given on formative assessment activities and on summative assessment activities.

For the purpose of this thesis any task that creates feedback (information which helps student learn from formative or summative activities) or feedforward (information which will help student amend or enhance activities in the future) to students about their learning achievements can be called formative assessment. In the literature on feedback the majority of writers focus on feedback to students being given in response to student assessment. However, there are many forms of feedback on learning, which do not necessarily relate to assessment – ranging from feedback on work in progress (eg during lab work) to more generic feedback on well a student is performing on their course of study (eg pastoral feedback in personal tutorials). All learning and teaching interactions between teacher and student in Higher Education (and between students and other students) are to some extent formative in nature – the critical discussion on formative feedback will be expanded on in chapter 3.

Opportunities for teaching staff to give formative feedback to students arise in a wide range of activities and interventions; including informal interactions, classroom situations, one to one tutorials, formative assessment activities, online learning, groupwork, as part of the process of summative assessment and work based placements and other work based learning. In some disciplines, such as the performing arts, sports and design there are opportunities to provide highly individualised

feedback which takes into account the students' previous developments, and uses this as the starting point for assessing progress or improvement of skills, knowledge and competence, this is referred to as ipsative feedback. Each of the different types of activities provides opportunities for formative feedback and can contribute to students' formative development and learning.

Formative feedback can take a range of formats, including;

- Tutor written feedback (a review of the literature on formative feedback suggests that the student perception of feedback centres mainly on written comments provided by academics on summative coursework assignments);
- Tutor verbal feedback (can be group or one to one);
- Self assessment and reflection (reflection as feedback to self); and
- Peer feedback.

There are many variables which potentially have an impact on student learning and formative feedback is only one of these variables. Other variables include quality of teaching, student motivation, learning environment and peer pressure.

### 1.2 The Study

The purpose in carrying out the research into the impact of formative feedback on student learning was to use the results from the research to inform and improve teaching in order to enhance student learning opportunities and improve student achievement. The aim of the thesis was to determine whether formative feedback has a positive impact on student learning and whether the provision of formative feedback can improve student achievement.

This thesis focused on written formative feedback on formative assessment and summative assessment activities – initial indications suggested that this was the type of feedback that students placed most emphasis on. The following figure, adapted from Wiliam (2008) indicates, via the red ovals, the main areas of interest in the thesis.

**Aspects of Formative Assessment**

| | Where the learner is going | Where the learner is | How to get there |
|---|---|---|---|
| **Teacher** | Clarify and share learning intentions | Engineering effective discussions, tasks and activities that elicit evidence of learning | Providing feedback that moves learners forward |
| **Peer** | Understand and share learning intentions | Activating students as learning resources for one another | |
| **Learner** | Understand learning intentions | Activating students as owners of their own learning | |

*Figure 1.1 Aspects of Formative Feedback and Areas of Research for this Thesis, adapted from Wiliam 2008*

One of the aims in undertaking this thesis was to reflect on the author's practice, based on Schon's (1995) model of reflection. It was intended to use the outcomes from the reflection to act as a catalyst for change in enhancing assessment and feedback in the author's institution.

The focus on improving professional practice from the author's personal perspective sought to adopt the Staff and Educational Development Association (SEDA) values of:

- Understanding how people learn,
- Developing scholarship professionalism and ethical practice,
- Working in and developing learning communities,
- Working effectively with diversity and promoting inclusivity,
- Continuing reflection on professional practice
- Developing people and processes

In order to facilitate a process of critical reflection on the author's practice an action research methodology was adopted. The rationale for choosing action research and the research design associated with the action research are discussed in chapter 4.

The principles of action research adopted in this thesis include the concept of reflective practice. The action research and reflection on that action research were used to consider practice and also provide a contribution to the field of assessment and feedback in Higher Education. As Schon (1995:19) argues “we should think about practice not only as a setting for the application of knowledge but also for its generation”.

The research carried out for this thesis compared 2 groups of students studying on similar but different programmes on the first year of their programmes at university. One group was given extra formative interventions, in particular formative feedback. Data has been gathered on cohorts of students over three academic years, 2006, 2007 and 2008. One of the groups, the computer forensics students, was examined further in their second year of study, comparing two modules, one where there was formative feedback and one where there was little feedback. Data was gathered for second year cohorts in 2007 and 2008. The effect of the formative interventions has been measured in student perception (qualitative) and summative achievement (quantitative) at module and at programme of study levels.

There are a series of expectations and perceptions of many HE ‘stakeholders’ for teachers to consider. Stakeholders in assessment (formative and summative) include students, academic colleagues, education managers, external examiners, professional bodies and agencies such as the Quality Assurance Agency. Each stakeholder has a different view on the purpose of assessment activities and potentially a different view on what constitutes appropriate feedback, this is discussed in more detail in the literature survey in chapter 3.

The aim in this thesis was to examine the ways in which students utilised formative feedback (on both formative and summative assessment) and determine the impact of feedback on student learning. The thesis looked at the impact of formative feedback on student achievement (through summative scores) and student attitudes to assessment and learning.

The objective in this piece of research was to compare the summative performance and the student perception of learning between groups of students who have had different experiences and levels of formative feedback in order to critically examine the impact of formative feedback on student learning.

This was carried out so as to inform practice, provide evidence for critical reflection and lead to a change in professional practice (initially by the author) in the domains of assessment and feedback.

The research question to be addressed in this thesis was – *Can formative feedback enhance student achievement?*

### 1.3 Benefit to Society and Academic Community

It is hoped that there will be a number of benefits at a number of different levels from the research presented in this thesis;

a) a better appreciation of whether the provision of formative feedback has an effect on student learning and student achievement. The literature advocates the importance of assessment and feedback and suggests that there is evidence that feedback can have a positive impact on student learning, but there is also contradictory evidence suggesting that there is no correlation between feedback and learning. It is hoped that the case studies in this thesis will enhance the understanding of the relationship between feedback and learning;

b) a better understanding of how students learn from formative feedback, which aspects of feedback are beneficial to students and which characteristics of feedback should be promoted and encouraged in staff development to enhance the student learning experience;

c) a better understanding of where academic staff should focus effort on feedback, how feedback relates to learning and how assessment design might be enhanced. This is particularly linked to issues around workload, the timing of feedback and the skills required by academic staff to provide constructive feedback;

d) the provision of data on formative feedback which can be used to help reconceptualise student feedback and promote the concept of generating feedback to enhance student

learning – this aim builds on the “assessment for learning” ethos advocated by, amongst others, Black and Wiliam (1998);

e) the nature of the Ed D and the development of professional practice means that (at least at the local level) there is evidence which can be used to reflect on the author’s professional practice in the provision of feedback. The information from the thesis will also act as a case study in encouraging others to reflect on their professional practice and as an instrument in future staff development activities in the author’s department.

## 1.4 Structure of Thesis

*Chapter 1*

This chapter introduces the topic to be studied in the research and indicates the potential benefits to society and the academic community as a result of the study.

*Chapter 2*

In this chapter the subjects of computer science and computer forensics are put in context, discussing the nature of both subjects, outlining the differences and indicating the programme structures of the two programmes used in the case studies. The way the study fits into the nature of the two computing programmes is included in this chapter. The higher education environment in which the study is set is described and issues associated with the academic calendar in the context of the study are presented. The way the study fits into the author’s institution is discussed in this chapter.

The rationale for considering feedback as an issue worth studying is presented and an examination of secondary data from the National Student Survey is included.

The nature of students reading for a degree, student motivation and why students want feedback are introduced. It is important to understand these issues and the impact they have in a study into the impact of feedback on student learning

A separate section on plagiarism is included because of the importance of plagiarism in higher education and because, although not central to this thesis, there are potential benefits arising from a study on formative assessment and formative feedback in understanding why students plagiarise.

*Chapter 3*

In chapter 3 a review of the literature on assessment and feedback is presented. The purpose of the literature review is to utilise the literature on assessment and feedback in order to shape the research question addressed in the thesis, identify topics to gather data on and to consider the educational issues surrounding formative feedback and formative assessment. In the literature review feedback themes such as timeliness, quality and feedforward are considered. The issues associated with the ways in which students engage, or don't engage, with formative activities is discussed in this chapter, and the issues associated with engagement, or lack of engagement, are introduced. The nature of dialogue associated with the provision of feedback and the potential benefits associated with dialogue are discussed with reference to the literature on feedback.

The findings from the literature review are used to shape the research questions in this study.

*Chapter 4*

This chapter focuses on the research methodology and the research design. The research question is discussed in detail and supplementary research questions identified. The rationale for the methodology and the research design are critically discussed and justified. The chapter concludes with a discussion on the ethical issues and ethical considerations taking into account throughout the project.

*Chapter 5*

In chapter 5 there is a discussion of the initial studies used to provide the basis for the classification of feedback types which are subsequently used in the formative interventions and in the analysis in chapter 6. The initial studies also provide an initial indication of the issues associated with the provision of feedback.

The "shape" and structure of the research design are explored in the context of the action research, the quantitative analysis, the case studies and the discussion groups.

*Chapter 6*

In chapter 6 an analysis of quantitative and qualitative data gathered to address the research question is presented. The objective was to determine whether the formative interventions had an impact on the student learning experience and the levels of student achievement.

The main quantitative statistic for measuring impact was the summative performance of the students. The analysis of the quantitative data compared the relative performance of the various groups of students, normally comparing one group who had received a formative intervention with a group who hadn't. The problems associated with the analysis of the quantitative data are presented.

The nature of the case studies and the ways in which the data from the case studies was utilised and analysed are presented in this chapter.

*Chapter 7*

The purpose of chapter 7 is to bring together the findings of the thesis and suggest recommendations and opportunities for further work in the topics of formative assessment and formative feedback.

The chapter summarises the findings of the research and indicate where the research potentially adds value to the academic community.

An evaluation of the project is presented indicating the subjects of importance in feedback.

The chapter brings together the conclusions from the research and finally an indication of potential areas for further work in the subject area of assessment and feedback are identified.

# Chapter 2 Context

## 2.1 Introduction

In this chapter a discussion on the subject background to the environment of the two groups in the study, computer science and computer forensics, is given, briefly looking at the underpinning principles of both subjects. The structure of the programmes used for the case study groups is outlined. The way the study fits into the nature of the two computing programmes is included in this chapter. The higher education environment in which the study is set is described and issues associated with the academic calendar in the context of the study are presented. The way the study fits into the author's institution is discussed in this chapter.

The context of the case studies used in the thesis are introduced in this chapter in order to provide the subject context of the case studies. The case studies are based on the author's teaching experience at Northland University, and the data used in the thesis have been gathered from students studying computer science and computer forensics at Northland. The nature of computer science, computer forensics and comparisons between the two are included in the following sections. However, since the initial data have been gathered the author has changed jobs and moved to the University of Southland. Therefore discussions on implementation of strategy and change management are based on experiences at Southland. This has not been an ideal situation from the viewpoint of the author and in terms of following up issues identified in the study. However, the case material gathered at Northland has been utilised in attempting to enhance the author's current teaching practice at the University of Southland.

A discussion on the learning environment for students in order to set the context for formative assessment and formative feedback is presented. A brief analysis of student motivation is included in this chapter because feedback has the potential to have a significant impact on student motivation both positive and negative. In the examination of the environment for the enhancement of learning a brief introduction on and why students want feedback is included in this chapter – this topic is returned to in greater depth later in the thesis.

The chapter concludes with a discussion on the management in the context of formative feedback and formative assessment.

Figure 2.1 illustrates the environment in which feedback is considered in this thesis. The diagram indicates the range of stakeholders who have an interest in feedback and the range of perceptions and expectations which make feedback a complex subject to study.

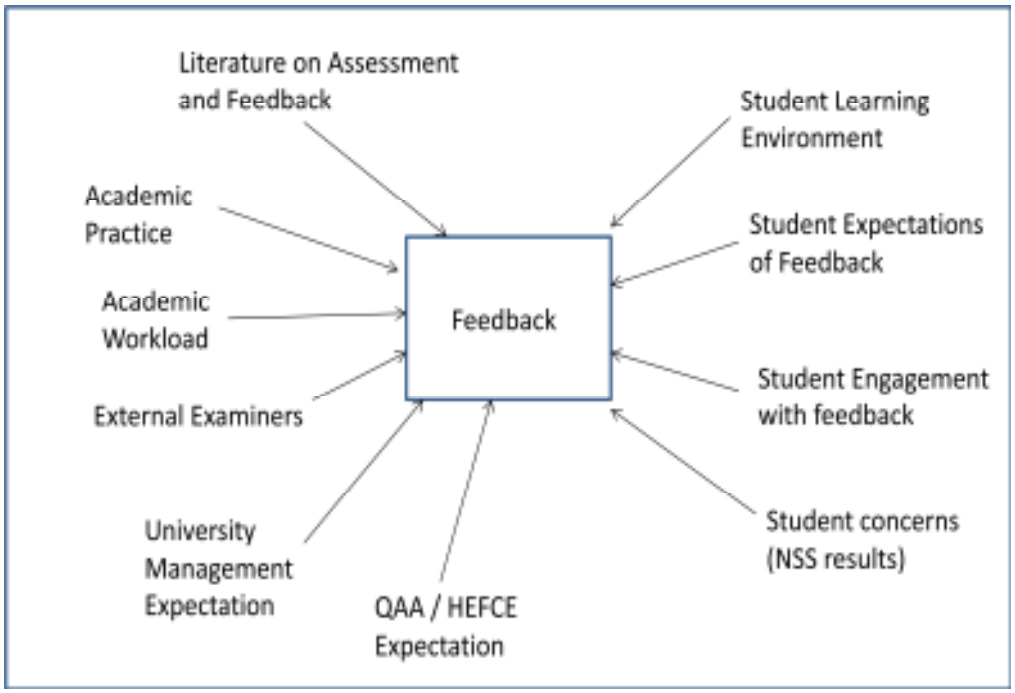



*Figure 2.1 Context of Feedback in Higher Education*

## 2.2 Higher Education Environment

In the UK students in Higher Education continue to be given a classification (even a pass / fail decision requires a summative judgement) on their awards and as such there is at some point some level of summative assessment for purposes of academic judgement (see discussion in chapter 3 on purposes of summative assessment).

Ramsden (1998:14) suggests that the Higher Education environment is undergoing a "fundamental change from an elite system of Higher Education, largely confined within national boundaries, to a

mass Higher Education system in a global business. Numbers, finance, structure, purposes, students, governance, confines, technologies, the amount of available knowledge and its diversity have all changed." Although Ramsden was writing in 1998 the environment of change continues to be a significant factor in Higher Education – for example legislation such as the Bologna Declaration (1999) will ensure that change in Higher Education is a continuous challenge. Much of the change is often contradictory – for example, making Higher Education accessible to everyone and at the same time introducing rises in student fees.

Government policy has a target to increase participation in Higher Education to 50 per cent of 18 – 30 year-olds by 2010. The Higher Education Statistics Agency (HESA) statistics indicate a 28% rise in the undergraduate student population in the UK between 1996/97 and 2004/05 and the growth continues despite the Higher Education Funding Council for England (HEFCE) setting number caps for 2009. Students continue to be recruited to universities on merit but from an increasingly diverse variety of academic backgrounds, thus resulting in large groups of mixed ability and diverse learning experiences. Teaching large numbers of mixed ability students presents a significant problem in terms of assessment and the provision of feedback.

There are a large number of changes currently taking place in Higher Education and it could reasonably be expected that assessment and feedback should be part of that change – for example, designing assessments which are manageable from a workload point of view, robust (valid and reliable) from an academic quality point of view and effective as learning mechanisms for students. However, as Gibbs (2005) suggests there has not been a significant change in assessment practices, the amount of summative assessment has not been reduced and the increase in student numbers has not been taken into account in terms of assessment. As a result assessment takes up a proportionately larger amount of time (for students and staff) and cost than it ever did before.

As with all educational developments and activities it is important to consider the nature of formative assessment and formative feedback for diverse student groups taking into account legislation such as the Disability Discrimination Act (1995) and the Special Education Needs and Discrimination Act (SENDA) (2001).

Formative assessment and formative feedback provide an opportunity to address inclusiveness and diversity. There has been a large amount of work on diversity undertaken by the HE Academy (for example, HEFCE, 2002; HE Academy, 2006) and from organisations such as the National Disability

Team (see http://www.techdis.ac.uk). However, the vast majority of this work focuses on teaching practice or on summative assessment rather than on formative assessment or formative feedback.

As student numbers in Higher Education have increased (Dearing Report 1997, Education White Paper 2003) there have been changes in the nature of Higher Education and economies of scale in learning and teaching methods – for example, larger classes, reduced contact hours and e-learning. However, some have argued (Gibbs and Simpson, 2004) that the economies of scale have not been achieved in assessment. According to Gibbs and Simpson (2004) this means that there is a huge pressure on teachers and students in dealing with the amount of summative assessment and that these pressures are to the detriment of the student learning experience. Not only does it mean that students are driven by summative assessment, but that summative assessment will curb other learning activities such as wider reading, groupwork and formative activities. In addition to this, Glover and Brown (2006) argue that the burden of the amount of summative assessment will mean that feedback is too slow and lacks the necessary quality to be effective.

In the current environment of mass Higher Education, there are staff student rations of 21:1 (AUT 2005), 27:1 (BCS AAC 2009) or even 35:1 (BCS AAC 2010), there is an increasingly diverse student body, there are many teaching pressures on staff, there are a wide range of bureaucratic demands on academic staff and there is an expectation that staff participate in research. Fitting the demands of timely and high quality feedback into an already full workload is a dilemma for academic staff. Carless (2006) indicates that managing time and workloads are significant challenges in the provision of feedback. This is particularly so when there is an aspiration to increase the quality, timeliness and regularity of feedback.

### 2.3 The Position of the Study in the HE Institution and the Computing Programmes

The study presented in this thesis is set in one School at the University of Northland. At the time of the study there were 9 Schools in the University. Each School had an Associate Dean (AD) for Learning and Teaching – the author was AD for Learning and teaching in his School. As part of the professional duties associated with the AD role there was an expectation from University management that consideration would be given to improving assessment and feedback. The author was also charged with chairing the University's Assessment Enhancement Group. The remit of this group was to review good practice in assessment and work alongside the Assessment for Learning Centre for Excellence in Teaching and Learning (AfL CETL) which was housed at the University of

Northland. Therefore this study was placed as an empirical study which would be shared with colleagues in the author's School and University as a basis for discussion.

The evidence from the 2005 National Student Survey suggested that Computer Science did not rank highly as a subject area in the provision of feedback to students. Whilst there were at the time (and still are) many other issues in the Computer Science discipline the provision of feedback was one which was an issue from the student perspective.

The author was able to use his influence as chair of the Council of Professor and Heads of Computing (CPHC) Learning Development Group (LDG) to ensure that the provision of feedback was on the national computing agenda. It was hoped that the findings from this study would be used as part of the enhancement discussion in the Computer Science discipline.

## 2.4 The Computing Programmes used as Case Studies (BSc Computer Science and BSc Computer Forensics)

### *2.4.1 Nature of Computer Science*

Computer science is a very diverse subject which is evolving and developing very quickly. This is reflected in the wide range of titles and curricula that are offered by Higher Education institutions (HEIs) in the UK. There is a computing benchmark document (2000) which has been revised and updated (2007) which outlines the possibilities for content of degree programmes. In addition there are professional bodies (for example the British Computer Society and Institute for Engineering and Technology in the UK) who specify the expectations of degree programmes when fitting to the professional body criteria.

Computer science is concerned with the understanding, design and exploitation of computation and computer technology, blending theoretical aspects of computing (also underpinning theories from related disciplines such as mathematics, physics, electrical and electronic engineering, psychology and business) with the practical solution (normally a computing solution) to problems in a range of diverse environments from business, industry, education and society. Practical solutions often, but not

always involve the development of a computing system or information system. Computer science encourages students to develop an understanding of systems and their operation – studying in depth what systems do or the way in which systems might be used.

The fundamental principles of computer science are utilised to underpin the concept of computational thinking. Computational thinking is the bedrock of computer science programmes. Computational thinking provides students with the skills and understanding to create and make use of different levels of abstraction, to understand and solve problems more effectively through a process of thinking algorithmically and applying mathematical concepts such as induction to develop more efficient, fair, and secure solutions.

The subject promotes innovation and creativity where the rapid change of technology can be utilised and exploited. At the same time there a disciplined approach to problem solving which embeds the need for the production of high quality solutions. Computer science programmes normally include concepts associated with the analysis and design of computer systems, problem solving, the nature of information and information processing and a series of levels of abstraction from which computation can be viewed. All of these areas require regular feedback to students to ensure students are learning about and understanding the subject matter. Computer science programmes typically include the study of the nature of computation and effective ways to exploit computation – often referred to as computational thinking. The main characteristics of computational thinking include:

- algorithmic thinking (including recursive, distributed and parallel possibilities);
- recognition of the relationships between the concepts of specification, program and data (in all its forms);
- understanding the concepts and power of abstraction.

### *2.4.2 Nature of Computer Forensics*

Computer forensics is defined by Bates (1997) as the “scientific examination and analysis of data held on or retrieved from computer storage media for the purposes of presentation in a court of law,

together with the study of the legal aspects of computer use and misuse", focuses on the collection, preservation and analysis of digital evidence in resolving computer crime. The timeliness of Bates' definition is apparent in a more recent definition (Gottschalk Liu, Datham, Fitzgerald and Stein, 2005) as "computer forensics deals with identifying, preserving, recovering, analysing and documenting computer data allegedly used in crimes committed using computers". The nature of any computer forensics investigation very much depends on the components of the particular case. However, as a result of the forensic nature (for use in legal argumentation) there is a need to establish a set of facts about what happened. In computer forensics this can be based around the state of the systems affected, either in terms of changes to the system or in terms of who changed what in the affected system and at the same time applying principles, theories and techniques from computer science and forensic science.

Computer forensics is the generic name for the analysis and reporting of findings from the forensic analysis of all computer or digital-related media. This not only includes PC/Laptop or Server hard drives but also other storage devices such as USB drives, MP3 players, memory cards, portable media and data gathered via network analysis. If data is stored digitally then it can be imaged and analysed using computer forensics techniques and tools. Digital evidence can be used to show that a crime has been committed, identify suspects, defend innocent parties, or help understand the motives and intent of individuals involved in cybercrime. Computer forensics is an example of a computing subject that takes one very specific aspect of computing and covers it in great depth. Whilst computer forensics derives principles from forensic science and computer science, there is a growing "common body of knowledge" (Rogers, 2003) which establishes computer forensics as a unique area of study. There is an expectation from students studying on computer forensics programmes that they will tend to seek employment opportunities in the specialist area. Computer forensics makes use of a number of the fundamental principles of computer science, for example how computers work, how data is stored and managed, how information is organised and how computers communicate over networks. Computer forensics makes use of the fact that every action and transaction on a computer is recorded, usually to a 'log file' which provides a list of transactions with important forensics information such as a time stamp. In addition to utilising the principles of computer science, computer forensics draws from a number of other disciplines. Computer forensics students make use of principles from criminology (understanding criminal justice system issues, motivation for undertaking computer crime); forensics science (determining significance of evidence; reconstructing fragments of data and drawing conclusions based on evidence found through hypothesis generation and confirmation); law (awareness of legal expectations and constraints) and mathematics (analysis of data, probability, etc.).

Computer forensics is much more than turning on a computer, making a directory listing and searching through files. There are rigorous processes and procedures which need to be followed in the identification, collection and analysis of data as evidence. It is very easy to 'contaminate' a suspicious situation by 'looking to see what's wrong' and by ignoring the principle, taken from forensic science, of 'do no harm'. In the UK, for instance, the procedures for the collection of evidence are defined in the Association of Chief Police Officers (ACPO) Good Practice Guide for Computer Based Evidence (2003). Evidential integrity and evidential continuity are the underpinning principles of computer forensics – there is no expectation that these principles would be included in a computer science curriculum.

The focus in the application of computer forensics has tended to centre on the resolution of legal cases associated with criminal activity in computing (ranging from economic fraud and computer misuse to identity theft and pornography) or in employment tribunal related activities such as disciplinary cases of computer misuse in organisations (for example e-mail harassment or false overtime claims). Gallegos (2005) argues, however, that "computer forensics is not only used for cybercrime cases, but the techniques and methods are also adopted for non-investigative purposes". Barbin and Patzakis (2002) suggest that computer forensics is "transitioning from an investigative and response mechanism to one of prevention, compliance and assurance". Of course whilst the emphasis tends to be on finding perpetrators of computer crimes, misuse and other misdemeanours, computer forensics can be used to prove the innocence of an accused person, just as good records management can demonstrate good management and good governance.

Computer forensics involves the examination and assessment of digital evidence. Computer evidence and digital evidence are like any other forms of forensic evidence; in order to be valuable to an investigation the digital evidence must be: authentic, accurate, and complete, (having evidential integrity), be convincing to juries and conform with UK (and possibly European) law and legislative rules. Some commentators (for example, Chisum, 1999) have defined digital evidence as being data that is stored or transmitted by a computer, which is used to uphold or dispute an hypothesis on how a crime occurred. Chisum (1999) has suggested that this data can be used to understand decisive aspects (intent, alibi, etc.,) of any computer crime committed.

Chisum's definition is taken a little further by Carrier and Spafford (2003) who have suggested that digital evidence that can be used to establish whether a crime has been committed, can also link the victim and the crime, and hence identify the link that exists between the criminal and the crime. However, it should be noted that Carrier and Spafford (2003) are assuming that evidence is used to

prove the existence of a crime, but the principles of computer forensics and digital evidence can also be used to prove the non-existence of a crime and / or innocence of those accused of a crime.

### *2.4.3 Differences between Computer Science and Computer Forensics*

The argument that the defining principle of computer forensics is the gathering of evidence (albeit digital evidence in a computer science domain and a computing environment) for presentation in court supports the argument that computer forensics has a different focus to the discipline of computer science, however, some writers such as Cooper (2005) argue that it is "unclear whether digital forensics [computer forensics] represents the emergence of a new academic discipline rather than a specialisation within computer science". Armstrong and Jayaratna (2004) suggest that "computer forensics requires a specialist computer knowledge". In order to undertake computer forensics investigation there is a need to be able to understand and apply the fundamental principles of computer science, for example how computers work, how data is stored and managed, how information is organised and how computers communicate over networks. Whilst there is the need for students of computer forensics to understand the principles and fundamentals of computer science it is a different discipline summarised by McKemmish (1999:1), "the feature of forensic computing [computer forensics] that sets it apart from any other area of information technology is the requirement that the final result must be derived from a process which is legally acceptable".

Both programmes comply with Higher Education Funding Council for England (HEFCE) regulations, the National Qualifications Framework, the Quality Assurance Agency (QAA) Computing Benchmark Statement and the British Computer Society (professional body for computing in the UK) expectations. In addition the computer forensics programme has embedded the Association of Chief Police Officers (ACPO) guidelines for handling digital evidence (ACPO, 2003) in the design of the programme. Currently there are no specific regulations from forensic science professional bodies for computer forensics programmes, but it is expected that this will change in the next few years. Already the Council for the Registration of Forensics Practitioners (CRFP) has begun to allow computer forensics practitioners to apply for individual registration (Everett, 2005), and is expected that bodies such as the CRFP will begin to move towards accrediting computer forensics programmes.

There is a large amount of overlap between the programmes included in this study. The computer forensics programme utilised the existing computer science programme as the starting point for design of the programme. In the first year there are 100 out of 120 credit points in common, 60 in the

second year and 40 out of 80 in the final year. The remaining 40 points in the final year is given over to an individual project and there is an expectation that the project is subject specific – so for a computer forensics degree a computer forensics project would be undertaken.

Year 1

| | | | | | |
|---|---|---|---|---|---|
| Common CS and CF<br><br>20 points | Common CS and CF<br><br>20 points | Common CS and CF<br><br>20 points | Common CS and CF<br><br>20 points | Common CS and CF<br><br>20 points | Different module between CS and CF<br><br>20 points |

Year 2

| | | | | |
|---|---|---|---|---|
| Common CS and CF<br><br>20 points | Common CS and CF<br><br>20 points | Common CS and CF<br><br>20 points | Common CS and CF<br><br>20 points | Difference is 2 x 20 point modules |

Year 3

| |
|---|
| Placement |

Year 4

| | | | |
|---|---|---|---|
| Final Year Project 40 points – common module, but students expected to specialise | Common CS and CF<br><br>20 points | Common CS and CF<br><br>20 points | Difference is 2 x 10 point<br><br>and 1 x 20 point module |

*Figure 2.2 Programme Structures*

As a result there is a large amount of commonality in the learning, teaching and assessment methods that both sets of students have access to. However, the different subject matter associated with computer forensics allows for differences in pedagogic approach. For the purposes of this thesis the intention has been to provide higher (greater quantity) levels of formative feedback, both in terms of feedback on formative assessment and in terms of formative feedback on summative assessment to the computer forensics students in order to try to isolate the impact of formative feedback, using the computer science group as the control group.

In order to teach computer forensics in as realistic a setting as possible a computer forensics laboratory was commissioned at the outset of the programme to provide students with opportunities to develop practical skills and techniques using computer forensics tools in a safe and secure environment. Specific hardware requirements (such as write blockers – to enable read only imaging) were included in the specification of the laboratory. Although the laboratory is networked (to facilitate network forensics) the laboratory is not connected to the university network. The computer forensics laboratory also acts as a base room for the computer forensics students helping to build a peer support culture and a cohort identity. This is potentially a variable which has an impact on computer forensics students and the computer science students do not have access to a base room.

Student expectation dictates that computer forensics resources will include the most up to date technology. If learning resources and technical facilities are outdated, shabby or unreliable some students may become disaffected or de-motivated. Many students have their own PCs, which are often of a higher specification than can be provided by universities. This has advantages in allowing them to choose their place of study but may raise other issues such as managing software copyright. This is particularly an issue in computer forensics where the industry standard software, EnCase from Guidance Software, has expensive licences and requires high specification PCs in order to work. The need to have access to such software encourages students to come in to the university to use the facilities outside of timetabled class sessions.

There is a need to take into account the differences between the subjects, the different expectations and motivations of students and the different pedagogic approaches when studying the impact of formative feedback. However, for both computer science and computer forensics students there is an element of feedback built in to many of the tasks that they undertake as part of their skills development, see Appendix 1 for typical examples of the feedback they get as common tasks in both disciplines.

## 2.5 Why Feedback is an Issue

In analysing the impact of feedback on student learning and achievement it is worth asking why academics or Higher Education institutions should care about student learning. The question of caring about student learning can be addressed at a number of levels, national, subject based, institution based and department based as well as at the individual student levels. As well as the moral responsibility for academics to consider the quality of student learning and levels of achievement there are a number of pragmatic economic reasons as to why care should be taken when considering the quality of student learning and the achievement of students. As indicated in the discussion on the Higher Education environment there is an increasing amount of competition between institutions and one way to differentiate from competitors is to be able to show that the institution cares about the quality of its learning.

There are financial incentives to ensure that students progress in their studies and do not fail or drop out, so there is a need to care about learning from that perspective. At national level better learning and higher levels of graduate achievement should be of benefit through the quality of the graduates. At the national subject level it is important that consideration is given to the process of learning in order to ensure the well being of the computer science discipline. At institutional level “better” quality of learning and “better” opportunities for learning will potentially mean more students enrol on courses and more students complete their programmes of study (this has been a particularly important issue recent times in the computing disciplines). The quality of learning is assessed in a number of ways for example QAA Institutional Audit, Professional Body Subject Review and external examiner reports as well as by examining the employability of graduates. One of the measures used in national league tables such as the Guardian and Times Higher Education Supplement is student achievement (measured by percentage of 1 and 2.1 degrees on undergraduate programmes). At departmental level the success of the department, and therefore viability of the department, is measured by the university executive through enrolment and retention / progression figures.

Feedback is an issue in Higher Education for a number of reasons, which include:

- lack of feedback (National Student Survey results);
- poor quality of feedback, for example feedback with lack of constructive support or feedback that is inconsistent or contradictory (NSS results; Black and Wiliam, 1998; Hounsell, Hounsell, Litjens and McCune 2005) ;

- lack of student engagement with feedback, (Nicol anad Macfarlane-Dick, 2004; Gibbs and Simpson, 2005);
- lack of understanding what students do with feedback or why they want feedback (see next section), Lea and Street (1998); Black and Wiliam (1998); Nicol and Macfalane-Dick, (2004);
- increase in academic workload issues – in particular having the opportunity and space to provide formative comments in a timely manner, (Carless, 2006; Glover and Brown, 2006).

It is not always the case that students are provided with feedback which allows them to learn from their assessments, as the following instances illustrate. Nicol and Macfarlane-Dick (2004:11) suggest that a great deal of "feedback information is often about strengths and weaknesses of handed-in work or about aspects of performance that are easy to identify (such as spelling mistakes) rather than about aspects that are of greater importance to academic learning but that are more abstract and difficult to define (such as strength of argument)". Mutch (2003) has found that feedback is often categorical in tone and not particularly explicit.

There are examples from the literature which illustrate that feedback is used inappropriately either to enhance the power relationship between tutor and student or as a means of introducing tutor bias. It is difficult to ensure that feedback is fair and fairness of feedback is one of the main concerns that students raise about the problems with feedback according to Holmes and Smith (2003). Fairness can also raise a different issue when the feedback might actually be inappropriate. Pelligrino (2001) cites the examples of tutors providing positive feedback to make students feel better or encourage students irrespective of the quality of the work being assessed.

One of the concerns raised in the feedback from the National Student Survey is that there are cases where students are provided with no feedback at all on their work. If students aren't provided with any feedback at all then it is certainly the case that students will not learn anything from the feedback. Not giving students any feedback will also potentially have an adverse impact on their motivation and will discourage students from participation in future assessments (either summative or formative).

The quality of feedback provided by tutors (or lack of quality) is a further concern raised in the National Student Survey. Poor quality feedback leads to the situation where the feedback won't contribute to student learning – especially when feedback is not constructive, isn't understood by students (Lea and Street, 1998), is too complex or is contradictory.

Poor quality feedback often contains contradictions and serves to confuse students rather than help them. For example, giving students a comment of “good work” along with a numeric mark of 35% is confusing for students and gives a mixed message. Is it “good work” or is it a failed piece of assessment. Ambiguous feedback does not help students to appreciate how well or how poorly they have performed in a specific task. Similarly ambiguous feedback does not help students to understand how to “close the gap” in their learning.

Related to the issue of contradictory feedback is the difference in approach and potential lack of consistency in the provision of feedback between academics who teach on the same programme. Lack of consistency can manifest itself as a problem either when a range of tutors are providing feedback on one piece of work (which should be picked up during moderation but this is not always the case) or between different modules on the same programme. Irrespective of how the situation arises, getting different types of quality of feedback from different tutors can be off putting and confusing for students.

One of the aspects of poor feedback is feedback which students think is unhelpful. Unhelpful feedback can take a range of formats and is seen by students as part of the reason that they do not engage with feedback. One of the worst forms of unhelpful feedback is feedback which is overly critical of student work (being overly critical serves no constructive purpose and can be very demotivating for students). Chamberlain, Dison and Button (1998) give a range of interesting examples of feedback which is unhelpful for students such as unfocussed comments (for example using terms like, “confused” or “generally sound” or “adequate” or “careful how you begin your sentences”) or dismissive or sarcastic comments (for example “did you experiment to find all this?” or “most of this is straight from the book”). These types of comments only serve to undermine student confidence and give no regard for the time and effort students have put into the activity.

Feedback from students and indications from the literature (Cowan 2003, Race 2005) suggest that giving feedback which is not timely is as bad as providing no feedback at all. Cowan (2003) suggests that the most effective feedback is provided “within minutes” of students completing a task. Not providing feedback on time really upsets students, will probably have minimal impact on their learning (so all the work that academics put into giving the feedback is wasted time) and will almost certainly become an issue which is reflected in student dissatisfaction.

As indicated in the next section students want to see the mark or grade for their assessed work. However, Butler (1988) argues that students pay less attention to tutor comments and formative feedback when they are given a numeric mark for assessments. As a result the students focus on the numeric mark, often using it as a means of comparison with their peers, and do not try to use the formative feedback to bridge the gap(s) in their learning or understanding. Craven, Marsh and Debus (1991) found that feedback given in numeric form has an "especially negative effect on the self-esteem of low ability students". Black (1999) argues that the best approach in formative feedback is not to use numeric indicators at all. The student perception of marks and grades is explored in chapters 5 and 6.

Students don't necessarily engage in activities the way academics expect them to and will act in situations according to the way they see or value the situation. It is often the case that the activities that are of value to students are not the same things that are of value to academics and vice versa. Similarly it is not the case that every student will respond to feedback in the same way. Higgins et al (2001:272) argue that different students are likely to "conceptualise feedback in qualitatively different ways". There is evidence in the literature to suggest that students do not always necessarily use feedback the way academics intend (Maclellan, 2001) often not engaging with the feedback or even reading it (Hounsell, 1987; Higgens and Hartley 2002) only using feedback to check their grade (Ding, 1998) and even when they use the feedback their interpretation of the comments is understood differently to the way the academic providing the feedback intended (Channock 2000; HiggensHartley and Skelton, 2001; Weaver, 2006).

A different set of reasons for feedback being an issue are raised when feedback is considered from an academic perspective. Much of the academic staff concern focuses on workload issues and lack of time to provide appropriate levels of feedback. Carless (2006) indicates that managing time and workloads are significant challenges in the provision of feedback especially when there is an aspiration to increase the quality and regularity of feedback. In addition to this, Glover and Brown (2006) argue that the burden of the amount of summative assessment will mean that feedback is too slow and lacks the necessary quality to be effective.

### 2.6 Why Students want Feedback

In order to understand how students make sense of feedback that is provided for them and appreciate how they use the feedback there is a need to examine why students want feedback at all. There are number of reasons why students want feedback – in summary these are: as an indication of how well they have performed on summative assessments; as part of the learning process; as an indicator of how they are doing; or as a contractual expectation. This section indicates the reasons that students want feedback and also indicates why it becomes a problem when students don't get the feedback they expect when they expect it.

As part of the indication on how well they are doing students want some indication of the quality of their work and how this is valued (Higgins and Hartley 2002). It is often the case that students do this by using the numeric mark or grade that tutors provide on student work as an indicator about their performance in an assessment task, a view supported by a number of commentators including Ding (1998), Adams Thomas and King (2000) and Duncan (2007).

Hall and Burke (2003:10) suggest that if students "know what to do to improve they can "close the gap" between what they can do or know and what they need to do or know". Hall and Burke go on to argue that "it is better to focus on causes of success and failure than to praise performance on the basis of the final product or completed task". Providing feedback which allows students to "close the gap" is part of what Yorke (2003) alludes to in his discussion of feedback changing student behaviour.

A great deal of recent literature on feedback focuses on the "assessment for learning" argument, where students use the assessment activities as part of the process of learning about the subjects they are being assessed on (Black, Harrison, Lee, Marshall and Wiliam 2003, McDowell, Sambell, Bazin, Penlington, Wakelin, Wicks and Smailes e 2005). Wiliam (2008) suggests that learners do not learn what they are taught and that there is a need for assessment to act as the bridge between teaching and learning, and thus *the central* process of teaching. The focus of the assessment for learning argument is that formative feedback will enhance learning and will encourage students to engage with the feedback and make use of the feedback to enhance their learning.

Part of the "assessment for learning" argument is that feedback is provided to students through feedback on formative activities or through comments on drafts for summative work as preparation for summative assessment. Using feedback as learning for future assessment, (feedforward according to Torrance 1993, Cowan 2003, Race 2005, Knight 2006, Hounsell 2006, Duncan 2007) raises the question of timeliness of receiving feedback. This opens a new discussion on the structure of courses

and modules and whether there is the opportunity to use the first assessment in a module as part of the learning for the second (assuming there is more than one assessment). The concept of feedforward (Cowan, 2003) identifies the intention that comments on assessment (feedback) should be used to inform students when it comes to the next assessment. However, feedforward, and consequently the use of feedback for learning is potentially problematic when there is only one summative assessment in a module. There are also potential questions about the way students use feed forward between different modules in a programme of study (Gibbs, 2005). The issues associated with feedforward are discussed in chapter 3.

Students use feedback to measure against the standard of academic work expected from them, both in terms of summative performance and in terms of academic conduct in areas such as plagiarism. It is often unclear to students what levels of depth and breadth they are expected to perform to. Even when students are given assessment criteria, either generic or specific to assessment activities, they have difficulty in interpreting what those standards mean. Rust, Prince and O'Donovan (2003) argue that students have problems in knowing what is meant by assessment criteria and appreciating the detail of the assessment process. They go on to suggest that student learning can be improved significantly by helping students develop skills in understanding assessment criteria. This subject is explored in the discussion of the scenario of providing feedback on mock exam questions and then discussing with students their interpretation of the formative feedback provided.

The current environment in Higher Education has been discussed in section 2.2 and one of the aspects of the Higher Education environment is that students believe that feedback on assessed work is part of their rights as a student, irrespective of the learning benefits associated with the provision of feedback. Students feel that it is only fair that they are provided with feedback after they have put in the effort to complete the assessment, students expect feedback as they "believe they deserve it" due to the effort made in carrying out the assignment task, (Higgins, Hartley and Skelton, 2001).

The arguments so far have centred on the quality of feedback provided to students, but comments from students about the feedback they expect (discussed in chapter 5) indicates that quantity of feedback needs to be taken into account. Lunsford (1997) advocates that there should be a maximum of three well thought out comments per essay or report. Lunsford also argues that feedback should relate to students how the reader "experienced the essay….. rather than offer judgemental comments". The intention is that such comments help the student to engage in reflecting on the feedback and trying to understand, as Lunsford puts it "the difference between his or her intentions and the effects".

There is also a consumerist expectation on the students' rights in terms of the provision of feedback. Higgins et al (2001) suggest that students view feedback as part of the service they have paid for. Gibbs (2005) takes the consumerist awareness angle even further and suggests that it manifests itself in an increasing amount of student complaint, appeal and even litigation. On the other hand a positive aspect to come out of the concerns of contractual right in being given feedback is identified by Higgins et al (2001) who suggest that the emerging consumerist awareness of students leads them to understand the importance of feedback in their educational development.

Irrespective of why students want feedback or what students do with the feedback when they get it, indications from students (for example through the National Student Survey) suggest that lack of feedback, timeliness of feedback and quality of feedback are perceived by students as major issues.

## 2.7 Rationale for Investigating Feedback

Various sources of evidence, including literature, Quality Assurance Agency (QAA) reports and student surveys including the NSS suggest that assessment and feedback are issues which have constantly been identified by quality assurance reviews as being an issue. Improvement in assessment and the associated feedback was identified in the review of QAA subject reviews as "the single intervention by universities and colleges that would improve the quality of the student experience", (QAA, 2004:27).

A summary of the literature indicates that there are issues in assessment and in feedback that should be explored particularly within the context of student learning. As indicated earlier assessment is key in Higher Education (Brown, 2001; Gibbs and Simpson 2004) and feedback is essential to help students learn from the assessment (Chickering and Gamson, 1991; Black and Wiliam,1998; Nicol and Macfarlane-Dick,2004; Nicol and Milligan, 2006). As has been indicated earlier in this chapter the evidence from the literature also suggests that feedback is an issue that is not particularly well addressed in Higher Education (Erwin and Knight 1995; Stefani 1998; Young 2000; Higgins and Hartley 2002; Hounsell, McCune, Hounsell and Litjens 2008; and Poulos and Mahony 2008).

The discussions earlier in this chapter on feedback, the problems with feedback and what students do with feedback indicate that there are issues which need to be addressed and strategies developed to propose changes in the way feedback is provided to students. Further evidence of the problems associated with student feedback in HE can be obtained from an analysis of the National Student Survey.

### *2.7.1 NSS Input*

The National Student Survey (NSS) forms part of the Higher Education Funding Council for England's (HEFCE) Quality Assurance Framework (QAF) and surveys final year undergraduates in England, Wales andNorthern Ireland. Surridge (2007:1) argues that NSS data is a "remarkably rich resource for understanding students' experiences of their courses, in terms of teaching quality". It is not the intention in this thesis to undertake a full critical analysis of the NSS, however the NSS does provide trend data which appears to concur with the issues raised in the literature, namely that assessment and feedback are serious student issues and that the responses for computer science show that the issue is important here too.

Recent scores in the NSS in 2005, 2006, 2007 and 2008 indicate that students perceive feedback to be an issue. Whilst the NSS is only one source of secondary data it does appear to substantiate the arguments raised in the literature that feedback on assessed work is an issue as far as students are concerned. 57% of students who took part in the 2008 NSS indicated that they are not satisfied with the standard of feedback they are receiving. Assessment and feedback on assessment have also been highlighted in the National Union of Students' 'Student Experience Report' indicating that poor assessment processes and procedures are a concern for students and are potentially having a negative impact on learning.

There have been many criticisms of the NSS calling into question the methodology of the questionnaire (particularly around agree / disagree type questions), the veracity of responses (e.g. issues with London Metropolitan and Kingston Universities allegedly "coaching" students), reported low participation rates, and the validity of the information coming from the NSS (Harvey, 2008).

Harvey (2008) argues that the NSS should be used as an improvement tool, but that it is too generalised for this to be the case. The NSS does not take account of the specific subject context or the learning environment in the student responses. Prosser (2005) raises concerns about the value of student surveys of teaching being used at all and advocates that they should be used with caution when considering student satisfaction.

Despite the failings of the NSS there is a trend that is emerging over the 4 years of the study. The NSS data suggests that there is a trend that the responses to the assessment and feedback questions obtain the lowest scores. Figure 2.3 shows the percentage scores for the 6 areas from the National Student Survey and the overall satisfaction score. The highlighted row indicates that in each year feedback has been the lowest overall score. Irrespective of whether the NSS is an appropriate tool it would seem that there are issues associated with assessment and feedback that require further investigation. It is this further investigation that this thesis seeks to provide.

Assessment and feedback have consistently been the lowest ranked areas in the National Student Survey – and hence the area for greatest student concern as can be seen in figure 2.3.

| **All Subjects – UK National** | | | | | |
|---|---|---|---|---|---|
| **Questions** | | **% Average Agreement** | | | |
| | | **2005** | **2006** | **2007** | **2008** |
| 1 – 4 | The teaching on my course | 80 | 81 | 82 | 84 |
| 5 – 9 | Assessment and feedback | 71 | 61 | 62 | 64 |
| 10 – 12 | Academic support | 75 | 69 | 71 | 73 |
| 13 – 15 | Organisation and management | 75 | 69 | 71 | 73 |
| 16 – 18 | Learning resources | 79 | 78 | 80 | 81 |
| 19 – 21 | Personal development | 80 | 76 | 77 | 78 |
| 22 | Overall satisfaction | 80 | 80 | 81 | 82 |

*Figure 2.3 National Student Survey Results – Overall 2005 - 2008*

source http://www.hefce.ac.uk/learning/nss/data/2008/

Figure 2.4 shows the breakdown of the five questions on assessment and feedback for 2005 to 2008. The highlighted questions indicate the feedback areas of assessment and feedback are the poorest scoring areas, with concerns around the timeliness of feedback (question 7) and clarification as a result of feedback (question 9) being the worst scoring questions. These concerns are borne out by the concerns raised in the literature, timeliness (Cowan, 2003) and feedback not clarifying understanding (Yorke, 2003; Nicol and Macfarlane-Dick, 2004).

| **All Subjects – UK National** | | | | |
|---|---|---|---|---|
| **Questions** | **2005** | **2006** | **2007** | **2008** |
| **Assessment and feedback** | | | | |
| 5 - The criteria used in marking have been clear in advance. | 65 | 68 | 69 | 70 |
| 6 - Assessment arrangements and marking have been fair. | 71 | 72 | 72 | 73 |
| 7 - Feedback on my work has been prompt. | 50 | 52 | 54 | 56 |
| 8 - I have received detailed comments on my work. | 56 | 59 | 60 | 62 |
| 9 - Feedback on my work has helped me clarify things I did not understand. | 51 | 51 | 53 | 56 |

*Figure 2.4 – National Student Survey Results – Assessment and Feedback 2005 - 2008*

source http://www.hefce.ac.uk/learning/nss/data/2008/

Breaking down data to compare subject against national average is only available for 2007, however as can be seen in Figure 2.5, computer science responses are lower than the national average in teaching and in assessment and feedback with the only area where there is a higher computer science score than the all subjects score is in the learning resources question.

| **Comparison All Subjects with Computer Science – UK National 2007** | | | |
|---|---|---|---|
| **Questions** | | **2007 All Subjects** | **2007 Computer Science** |
| 1 – 4 | The teaching on my course | 82 | 74 |
| 5 – 9 | Assessment and feedback | 62 | 60 |
| 10 – 12 | Academic support | 71 | 71 |

| | | | |
|---|---|---|---|
| 13 – 15 | Organisation and management | 71 | 71 |
| 16 – 18 | Learning resources | 80 | 83 |
| 19 – 21 | Personal development | 77 | 75 |
| 22 | Overall satisfaction | 81 | 78 |

*Figure 2.5 Comparison of all subjects with computer science – UK National 2007*
source http://www.hefce.ac.uk/learning/nss/data/2007/

The following comparison, Figure 2.6, illustrates how well the university does in comparison with the sector. The assessment scores compare well with the sector and the response on the feedback shows the university to be comparing favourably with feedback, particularly in 2008 where all the feedback scores are higher than the sector.

| **All Subjects – UK National and Northland Comparison in Assessment and Feedback** | | | | | | |
|---|---|---|---|---|---|---|
| **Questions** | **2006 All** | **2006 N'land** | **2007 All** | **2007 N'land** | **2008 All** | **2008 N'land** |
| 5 - The criteria used in marking have been clear in advance. | 68 | 74 | 69 | 72 | 70 | 78 |
| 6 - Assessment arrangements and marking have been fair. | 72 | 71 | 72 | 69 | 73 | 76 |
| 7 - Feedback on my work has been prompt. | 52 | 52 | 54 | 46 | 56 | 64 |
| 8 - I have received detailed comments on my work. | 59 | 61 | 60 | 56 | 62 | 68 |
| 9 - Feedback on my work has helped me clarify things I did not understand. | 53 | 54 | 53 | 49 | 56 | 61 |

*Figure 2.6 Comparison of Northland with Sector – All Subjects*

source http://www.hefce.ac.uk/learning/nss/data/2008/

| Northland Comparison in Assessment and Feedback between University and Computer Science | | | | | | |
|---|---|---|---|---|---|---|
| **Questions** | **2006 N'land** | **2006 N'land CS** | **2007 N'land** | **2007 N'land CS** | **2008 N'land** | **2008 N'land CS** |
| 5 - The criteria used in marking have been clear in advance. | 74 | 78 | 72 | 81 | 78 | 80 |
| 6 - Assessment arrangements and marking have been fair. | 71 | 76 | 69 | 76 | 76 | 77 |
| 7 - Feedback on my work has been prompt. | 52 | 68 | 46 | 40 | 64 | 61 |
| 8 - I have received detailed comments on my work. | 61 | 72 | 56 | 62 | 68 | 62 |
| 9 - Feedback on my work has helped me clarify things I did not understand. | 54 | 70 | 49 | 63 | 61 | 63 |

*Figure 2.7 Comparison in Northland between all subjects with computer science*

source http://www.hefce.ac.uk/learning/nss/data/2008/

In figure 2.7 data for computer science in Northland University is compared with the University overall scores and indicates that there is a perceived problem in the timeliness of feedback being returned to students. In 2006 computer science was above the university score in all the assessment and feedback categories, but there is a major decrease, particularly in the feedback questions, between 2006 and 2007. This can be explained to some extent by structural change where the previous

schools of Engineering and Informatics merged, and this potentially had an adverse impact on academic staff morale. The “detailed comments” score in computer science is higher in 2007 than the university score, but this is reversed in 2008, although the computer science score is the same between 2007 and 2008 the university score increased by 10 percentage points. The computer science discipline does better than the university in feedback helping students to clarify things that they did not understand.

In all five of the figures the indicative trend at national, institutional and discipline levels is that feedback has a great deal of room for improvement, and the NSS data supports the rationale for the need to study feedback and to do something about improving feedback.

### 2.8 Academic Calendar

Many Higher Education Institutions moved to a modularised or unitised structure in the 1990s which was supposed to allow students to accumulate academic credits and move between programmes and institutions in building up enough credit to obtain an award. This process had a significant impact on assessment, particularly on formative assessment and formative feedback – a greater amount of summative assessment and more frequent summative assessment meant less time for formative activities, according to Gibbs and Simpson (2004).

Many modules or units were designed as small 10 or 15 point “chunks” (there are 120 credit points per academic level, 3 levels in an undergraduate programme) all of which had to be assessed and were normally taken over a 12 or 15 week semester (2 semesters per year) – there are of course a number of exceptions to this structure, but it was very common, particularly in post 1992 universities, and is the structure of the academic calendar in the institution under consideration in the case studies in this thesis

The structure of programmes and modules potentially means that there is little time for teachers to utilise formative activities either because of very full curricula or because of the size of modules and the short time span associated with these modules (Gibbs 2005). The modularised structure of programmes also contributes to the issues in providing timely feedback to students (Weaver, 2006). Gibbs (2005) suggests that many institutions are moving towards larger modules (20 to 40 points in

120 credit point annual structure) and year-long modules (as opposed to semester based) but that there are also difficulties in changing to structures which will help with formative activities because of university regulations.

One of the consequences of modularisation was that summative assessment had to take place more frequently, often without giving students the time to absorb their learning, experiment or undertake any trial and error learning. A common situation was for students to finish their teaching in one week and be examined on the module the next, Entwhislte and Entwhistle (2003) bring attention to this situation suggesting that students lose the opportunity for revision or consolidating their learning and understanding before examinations. There was (still is) very little time for formative activities and little time for teachers to provide constructive formative feedback. The consequence of this is that students become driven by summative assessment (Brown 2001, Gibbs and Simpson 2004), disengage with formative assessment (Gibbs and Simpson 2004) and feel that formative feedback on end of module summative assessments adds no value to their future modules (Brown 1999, Torrance and Pryor 2002, Gibbs 2005). These consequences are examined in the context of the school under investigation and are returned to in Chapter 6 of this thesis.

Summative assessment tends to occur towards the end of courses as suggested by Torrance and Pryor (2002:8) “summative assessment is generally considered to be undertaken at the end of a course or programme of study in order to measure and communicate pupil performance and (latterly) accountability”. Brown (1999:6) supports Torrance and Pryor’s suggestion by arguing that summative assessment “tends to be end point [final task in a module], largely numerical and concerned mainly with making evaluative judgement”. The fact that summative assessment tends to be at the end of a period of study may have an adverse impact on students managing their time effectively or may mean that they have too much summative assessment to deal with at one time.

### 2.9 Student Motivation and Drivers

Students in Higher Education have a wide range of motivations and a variety of drivers. According to Brown, Armstrong and Thompson (1998) in order for students to learn effectively they need to be motivated to learn. If formative assessment and formative feedback are to be successful learning tools then there is a need to appreciate that formative assessment doesn’t solely depend on the learning activity and the resultant feedback, but as Black (1999:125) suggests “on the broader context about the motivations and self-perceptions of students”.

In considering motivation as one of the challenges in formative assessment and feedback, it should be emphasised that motivation is not a straight forward subject to understand or to address. Motivation is likely to vary between students in a group and between different groups of student. Often a formative exercise will work really well with one group of students and when the session is repeated with a different group of students and it falls completely flat. In addition a student's own motivation will develop and change throughout their time at University – for example, the motivation of a first year student during their first semester is likely to be different to a final year student completing their final year project.

Motivation for students to participate and engage in Higher Education covers a number of drivers, but one of the main motivations associated with learning focuses on forming goals and making an effort to achieve them (related to student ownership of their learning). Race (1995) refers to this as a student's level of "wanting to learn". Bostock (2004:87) that "assessment informs students about the real goals for a course". Students' motivations may vary and may well change throughout the duration of a programme of study. The distinction is often made (e.g. Ashcroft and Palacio, 1996:29) between intrinsic motivation (to understand the subject) and extrinsic motivation (for a reward such as employment of degree classification). Carter and Boyle (2002) suggest that many students enrol on computer science programmes more in the hope of getting a degree rather than a thirst for knowledge of computer science. One way to encourage student motivation is through the provision of formative feedback. Nicol and Macfarlane-Dick (2004:3) suggests that formative assessment and feedback should be "used to empower students as self-regulated learners and that more recognitions should be given to the role of feedback on learners' motivational beliefs and self-esteem".

At first glance it may seem that students are driven mainly by extrinsic factors, normally a desire to get a job at the end of their degree (Carter and Boyle, 2002). However, as indicated in the discussion in this thesis there is evidence of a desire to learn. Feedback can help in addressing intrinsic motivation through encouraging students to learn and to "close the gap" on their understanding of subjects.

It is suggested in the literature (e.g. Murphy, 2006) that it is assessment that indicates to students what really matters on a module or programme of study and it is assessment informs students about the goals of the module or programme. Brown (2001) put forward the argument that "assessment defines what students regard as important, how they spend their time and how they come to see themselves as individuals". Gibbs and Simpson (2004) suggest that "assessment is seen to exert a profound influence on student learning: on what students focus their attention on, on how much they

study, on their quality of engagement with learning tasks, and, through feedback, on their understanding and future learning". Hamdorf and Hall (2001) indicate that assessment is important because it has such a powerful influence on the learning behaviour of students. Assessment can be seen to be one of the key motivators for students and is fundamental in determining what it is that students value in their education.

The effort that students make towards achieving goals is affected by how they feel about those goals and how they perceive the likelihood of achieving those goals. Brown, Bull and Pendelbury (1997) argue that "students take their cues from what is assessed rather than from what lecturers assert is important". Assessment can be seen to act as a positive motivator for students if they think the assessment is relevant to their broader goals.

This section on motivation focuses on assessment in general and no distinction has been made between summative and formative assessment. The rationale for discussing assessment generally is that because of the amount of summative assessment it is difficult enough to encourage students to participate in summative activities (extrinsic motivation – where they at least see the motivating value of it contributing toward their award) – as opposed to encouraging them to engage in formative activities which are designed to help students understand their subjects (intrinsic motivation). However, the concept of summative assessment being a student driver and students participating and engaging in activities that they perceive as valuable, has an impact on the way academic staff utilise formative activities and the level to which students will engage in formative assessment and formative feedback.

It is important that academics are aware of the motivating effect of feedback, particularly positive feedback, on students. Schunk (1989) suggests that positive feedback will enhance student confidence in their academic abilities and as such improve academic performance as students develop confidence in their academic abilities. In other words a self-perpetuating confidence spiral improves academic performance.

Feedback can have a positive motivating effect on students, but great care should be taken to ensure that positive statements are actually helpful. If students are given positive comments purely to encourage and motivate them to engage in further study, or as a reward for the effort they have put in (there is an argument that effort rather than achievement should be rewarded) then they could get a false sense of achievement and false sense of their understanding of the subject.

Not only is there a need to take great care in the positive comments that lecturers and tutors provide for students in feedback, they need to be careful not to de-motivate the students. There persists a student belief that teachers "know best" and that students will react to every comment teachers make (Ramsden 1992, Kember, 2001). However, as shall be discussed later in the thesis the quality of feedback is not always constructive or "good" and there many examples of "bad practice" in the provision of feedback.

Students can be de-motivated as a result of feedback particularly when;

- they perceive the feedback to be unfair;
- feedback is unclear;
- they don't understand the feedback;
- the feedback doesn't seem to relate to the work they have done;
- they don't receive feedback in time, or don't get any feedback at all;
- feedback is overly critical; or
- feedback is non-constructive.

These issues will be returned to in chapters 5 and 6.

## 2.10 Plagiarism in Higher Education

"Plagiarism is not a new phenomenon and has always been an issue in academia", (Slater, 2000:1). Phillips and Horton (2000:1) suggest that "studies examining issues of academic integrity have been of interest to teachers since the 1940s". However Slater argues that the access to technology in today's Higher Education environment mean that the "opportunities for plagiarism have increased", and Bull, Collins, Coughlin and Sharp (2001:28) in a UK survey on the extent of plagiarism found that the number of cases of plagiarism that had been detected had increased in recent years. Brown and Howell (2001:103) summarise the nature of the issue by indicating that "there are new concerns that the ready availability of material in electronic form on the world wide web means that to plagiarise requires less effort, and at the same time the possibility of detection is reduced. Parmley (2000) in a survey undertaken at MIT found that over 80% of students on a computer science programming admitted to cheating. Newstead, Franklyn-Jones and Armstead (1996) also found substantial number of students cheating on courses but also found that academic tutors underestimated the amount and extent of plagiarism.

There are many reasons that students provide as a reason for plagiarising. Poor time management is often cited as a rationale, “last minute panic may make plagiarism seem the only option”, Caroll and Appleton (2001:1). One way for students to overcome the problem of poor time management is to copy material for their summative assessments from the Internet.

Caroll and Appleton (2001) also suggest that students plagiarise inadvertently because they actually do not understand what is meant by the concept of plagiarism. This is a reason emphasised by Ashworth, Bannister and Thorne (1997) who indicate that students are not clear about what is meant by plagiarism.

Steffani and Carol (2001) argue that the message about plagiarism is not something that can be mentioned once and then forgotten about. It is something that needs to be repeated many times. It is potentially possible to use formative assessment and formative feedback as part of students’ education about plagiarism and other forms of academic misconduct.

It is not the intention in this thesis to discuss in detail the issues associated with plagiarism. However whether students and academic staff believe that formative activities can be used to help educate students about plagiarism will be explored. The contention is that formative activities can be designed to help address plagiarism and other forms of misconduct and provide students with feedback on academic standards and expectations in the “safe” environment of formative assessment.

### 2.11 Feedback and Academics

In Black and Wiliam’s (1998) discussion on formative assessment they suggest that one of the outcomes from formative activities is that it is used to “adapt the teaching work to meet the needs”. Black and Wiliam (1998) take the point further in suggesting that formative assessment includes “all those activities undertaken by teachers and by their students assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities in which they are based”. Applying Black and Wiliam’s suggestion means formative feedback can lead to an immediate change in teaching or be considered in the longer term for module or programme change.

Yorke (2003:482) suggests that the “act of assessing has an effect on the assessor as well as the student. Davidovitch and Soen (2006) suggest that the way students tackle assessments can be used to improve the quality of teaching by academics using the feedback to reflect on their teaching practice. Assessors learn about the extent to which the students have developed expertise and can tailor their teaching accordingly”. Reflecting on how students respond to formative assessment and formative feedback provides the opportunity to consider the effectiveness of the teaching and learning methods and techniques being employed. Interpretation of student perception and understanding of formative activities provides a substantiated rationale for modifying activities and practice.

There are many opportunities to adjust teaching practice in order to take into account the results of assessment (formative and summative). Depending on the type of assessment and the timing of the assessment this could mean a change to the teaching scheme in a module, with more time spent on areas students are having problems with (care needs to be taken to ensure coverage of whole syllabus) or be used as useful input to module review with changes taking place in the next iteration of the module (having gone through the normal QA processes and procedures).

Formative assessment can provide information for academics on the subject areas that students find difficult or are experiencing difficulties. This in turn can provide information on where to focus teaching efforts or to review the particular teaching techniques used in that subject area, (Black and Wiliam, 1998; Prosser and Trigwell, 1999; Nicol and MacFarlane-Dick, 2006).

There are many ways to determine the subjects that students are having difficulty in grasping. One of the key opportunities is in the generation of feedback – if academic staff find that they are providing similar feedback to many students then it may well be an indicator that students have either not understood the subject that the assessment pertains to or perhaps that the assessment task was not particularly clear (perhaps in language or in level of guidance).

There is the opportunity to obtain feedback on the quality of the formative feedback that academics provide from a student perspective, for example by discussing with students how the feedback that has been provided helps in student learning. It is often the case that student perception of the formative activity is different to the academic perception, and indeed as Wiliam (2000:15) surmises, “there is considerable evidence that many students in classrooms do not understand what it is that

teachers value in their work". In order to improve the formative activities and improve the learning opportunity there is a need for staff to reflect on the effectiveness of the formative activity and one way of doing this is by obtaining student feedback.

At the Open University examination of the feedback is done independently from the teacher who provides the feedback (Gibbs 2005). Swing (2004) argues that by academics acting as a role model seeking and using external feedback that the students will see the value in undertaking a similar process. It might seem a little strange trying to obtain feedback on feedback but getting student feedback on the formative assessment activities and the formative feedback provided on these activities can contribute a very positive input to the academic's understanding of the effectiveness of the feedback provided and potentially a better understanding of what it is (assuming that it is something) that students have learned from activity.

### 2.12 Management of Change

In this thesis an action research approach was used in order to reflect on the author's own practice, but as indicated earlier there was an aspiration to manage change in the author's own practice but also to change practice in the author's department and university. In order to affect change in others consideration was given to the process of managing that change. In this section the issues in the management of change in the context of changing the provision of formative feedback and formative assessment are considered. Part of the rationale for undertaking the research in this thesis was to provide case material to support the management of change in the provision of formative feedback.

One of the problems with any change in education is knowing what to measure in deeming whether the change has been a success or not. The intention in this project is to illustrate the impact formative feedback and formative assessment can have on student learning and share the findings of the case studies to advocate change in current practice.

Change in education can be either proactive or reactive. The aspiration in this project is to provide evidence which will encourage proactive change in academic practice in the provision of feedback for students, although it could also be argued that the proposed changes are reactive in responding to concerns raised by students in the National Student Survey.

The literature on change management in education suggests that there is likely to be a certain resistance to any proposed changes. Fullan (1991:106) suggests that change is unlikely to happen without conflict and disagreement, indeed that "conflict and disagreement are not only inevitable but fundamental to successful change". It was not the intention to have conflict in this project but as will be discussed in considering the viewpoint of academics there was a range of responses from colleagues in their reactions to the findings from the case studies which suggested an element of resistance to any change in practice that was suggested as a result of the case studies. Ramsden's (1998:39) suggests that part of the challenge in managing change in Higher Education lies with the people mangers are trying to mange, claiming that "there is a tension between certain academic's conceptions of themselves as the exclusive protectors of excellence and the imperatives of mass Higher Education systems which are (precariously) public funded". Senge (1995) summarises that educationalists are masters at subversion, and in some cases that subversion may manifest itself through using conflict and disagreement to block change. Other sources such as Newton and Tarrant (1992), although appreciating the inevitability of conflict and disagreement, advocate consultation and negotiation rather than conflict and disagreement.

The principle adopted in this project is to utilise Everard and Morris' (1996:92) suggested approach in attempting to avoid confrontation but at the same time reach some level of agreement in that change. One way of minimising potential conflict is to keep the case studies to a localised situation. Wallace and McMahon (1994:84) find less conflict at local levels, "little evidence of conflict over direction of school development at school level".

A further benefit of utilising small case studies is that there is an opportunity to analyse and discuss the impact on the people of the proposed changes in practice with those who will need to work with the changes. This is an advantage supported in Morrison (1998:17) supports this point by stressing, "change is likely to be successful if it is: congruent with existing practices in the school; understood and communicated effectively; triallable and trialled; seen to be an improvement on existing practice by the participants; seen to further the direction in which the institution is moving".

Morrison (1998:13) goes on to suggest that change is a process of transformation, either initiated by internal factors or external forces, involving individuals, groups or institutions, leading to a realignment of existing values, practices and outcomes". In proposing changes in assessment it is important to consider where the changes are coming from and who the changes are for. In the case of this thesis, this is considered from the perspective of students.

Gibbs (2005) has indicated there is an overwhelming burden of summative assessment on students and staff – to the detriment of learning. Any change in assessment strategy should be seen to address the workload issue.

From a management perspective there is a huge cost associated with assessment. Gibbs (2005) asserts that the cost of assessment is now greater than the cost of teaching in HEIs in the UK. It would therefore seem timely to address the volume of assessment from the financial perspective as well as the educational one.

The intention in reflecting on the author's own practice in this thesis was to use the example to promote change in practice in formative assessment and formative feedback and to take heed of Newton and Tarrant's (1992:217) warnings that any imposed changes are likely to fail because;

> "Nobody likes being told to do something",
>
> "Nobody likes having to do something",
>
> "Nobody likes being consulted then not listened to".

One of the aspirations in this project was to illustrate through the case studies the issues and benefits associated with the provision of formative feedback and the use of formative assessment. One of the implications (and indeed challenges) in the management of change in education, and with the case studies, is to provide an environment that will facilitate communication, positive debate, allowing for conflict and disagreement, without the potential negative aspects of discussion over-riding the positive aspects. Attempts were made to ensure that discussions with colleagues took place in an environment which allowed participants to feel comfortable in making their views heard, including views that contradicted the adoption of formative assessment and formative feedback changes.

### 2.13 Workload Issues

In addition to considering how academics can improve feedback by addressing issues such as timeliness, extent of feedback and quality of feedback, a great deal of the literature on feedback is given over to how to manage the process of generating feedback so that an academic's workload is not dominated by creating feedback (Carless 2006; Glover and Brown 2006).

It is recognised that significant effort is required in the design of effective formative assessment activities and the production of quality of formative feedback. Hence, there is a need for commitment, engagement and "buy in" from all those concerned, i.e. management, academic staff, administrative support and, perhaps most importantly, students.

As well as an educational and motivational rationale for the reduction in summative assessment and the improvement of formative assessment there is a pragmatic workload consideration to take into account. If summative and formative activities exist in parallel there is the potential that an intolerable burden will be placed on academic members of staff and students.

### 2.14 Chapter Summary

The context in which this research is set has been presented in this chapter in terms of the changing Higher Education environment and the management of change in Higher Education. The rationale for investigating feedback as an issue has been presented by indicating why students need feedback and by considering the secondary data from the National Student Survey where student concerns regarding feedback are brought to the fore.

The challenges in addressing the issues which providing feedback presents, for example the academic calendar and staff workloads have been introduced in this chapter.

The environment in which feedback sits is a very complex one and in analysing feedback within that environment it is difficult to isolate the effect that feedback has on student learning. The literature on assessment and feedback will be critically analysed in chapter 3.

## Chapter 3 Literature Review - Assessment and Feedback

### 3.1 Introduction

The purpose of this chapter is to utilise the literature on assessment and feedback in order to shape the research question addressed in the thesis, identify areas for data gathering and consider the educational issues surrounding formative feedback and formative assessment. The "distinction between formative feedback on summative assessment and feedback on formative activities is discussed. Gibbs (2005) suggests "feedback" should still be associated with summative assessment and much of the discussion of formative feedback in the literature relates to feedback on summative assessment rather than feedback on formative assessment.

There is an inextricable link between assessment and feedback and herein lies one of the greatest challenges in being able to produce a clear distinction between formative and summative assessment. Yorke (2003) refers to this "definitional fuzziness" being due to the range of formative assessment: from a very informal process where feedback is likely to be verbal through to tasks which are actually intended to functionally perform in a formative manner but in reality act summatively, for example written feedback (formative) on a student assignment (summative).

The main research question in the thesis – *Can formative feedback enhance student achievement ?* – is rationalised in this chapter with a discussion on the concept of importance of assessment and related feedback with an examination of how does this links to learning. The literature is used to provide a rationale as to why formative assessment and feedback have been chosen as the key topics of this thesis and why it is important to examine formative assessment and formative feedback as part of the process which will actually enable and enhance student learning opportunities.

There is a large amount of literature on assessment – incorporating behaviourist,

cognitive, constructivist and socio cultural (situative) approaches to education. Much of the literature on assessment focuses on summative assessment but there is also a large body of literature centred on formative feedback and on formative assessment.

Formative assessment and formative feedback are potentially powerful and potentially constructive learning tools and are widely acknowledged as providing a valuable contribution to the process of student learning (for example, Hattie, 1987; Sadler, 1989; Brown et al, 1997; Black and Wiliam, 1998; 1999; Askew, 2000; Knight, 2001; Laurillard, 2002; Knight and York, 2003; Taras, 2003; Hall and Burke, 2003; Roos and Hamilton, 2005).

In this chapter various definitions associated with formative feedback as well as formative and summative assessment will be critically discussed. The literature survey has been used to identify the key issues and as such to focus the research in this thesis.

The debate in the literature identifies a number of interlinked and interrelated strands:

- The purpose of assessment (summative and formative)
- The purpose of feedback, and the potential issues with feedback
- The role of assessment and feedback in student learning

These topics are discussed in this chapter within the context of the thesis topic as the basis for the rationale in examining feedback. The structure of the remainder of this chapter presents a critical discussion on the literature on assessment and feedback – examining the purpose of assessment; formative assessment and finally formative feedback in order to critically discuss the issues associated with assessment and feedback and to use the literature to shape the research design.

## 3.2 Definitions

This section outlines how terminology is used throughout the thesis. A summary of the literature on formative feedback suggests a high-level definition of formative feedback could be any information (written or oral) in response to student activities which helps the student to learn from those activities. This definition is derived from a number of sources including, Black, (1999); Maclellan, (2001); Yorke, (2003); Nicol and Macfarlane-Dick (2004), and is an amalgamation of the principles

It is suggested in Knight (2001) that **summative assessment** is for “judgement” and **formative assessment** for “improvement”, but Yorke (2003) argues that the concept of formative feedback is not as simple as it seems. The potential confusion becomes apparent when formative feedback is given on summative assessment or summative marks are allocated to formative activities.

In addition, **feedforward** (Cowan, 2003) is information, normally provided at the same time as feedback which is information which will help students amend or enhance their knowledge and understanding and, as a result, their academic performance in the future – this can be for future assessment activities (summative or formative) or for other learning activities.

There is further potential confusion in defining the concept of feedback in that information gathered from students about their teaching or their course is also referred to as student feedback. However, in this thesis the concept of student feedback refers to feedback to students on activities they have undertaken.

**Formative assessment**, in this thesis, is taken to be any activity where feedback is generated to give students information on their performance or to improve their learning, but is not used in a progression decision.

For the purposes of this thesis **summative assessment** is taken to be any assessment activity where a mark or grade to a piece of work is allocated and this mark or grade is used in a progression decision.

### 3.3 Purpose of Assessment

Reviewing the literature suggests that assessment is one of the key motivators for students and is fundamental in determining what it is that students value in their education. For example Murphy

(2006) suggests that it is assessment that indicates to students what really matters on a module or programme of study and it is assessment that informs students about the goals of the module or programme. Brown et al (1997:7-8) put forward the argument that "assessment defines what students regard as important, how they spend their time and how they come to see themselves as individuals". Gibbs and Simpson (2004) support this perspective summarising that assessment is seen to exert a profound influence on student learning; in areas such as: what students focus their attention on how much they study; the quality of engagement with learning tasks, and, through feedback, on their understanding and future learning. Hamdorf and Hall (2001) indicate that assessment is important because it has such a powerful influence on the learning behaviour of students. Brown el al (1997:7) also identify one of the dilemmas in assessment in that "students take their cues from what is assessed rather than from what lecturers assert is important". Maclellan (2001) found a discrepancy between students and lecturers as to what constitutes helpful feedback.

A review of the literature on assessment suggests a range of functions of assessment. The following sub sections explore the reasons for assessment.

### *3.3.1 Requirements of Assessment*

The principles of assessment (Nicol and Macfarlane-Dick, 2004) require that assessment is reliable, valid, affordable and fit for purpose, i.e. usable. Reliability in assessment requires the assessment to be objective, accurate, repeatable and analytically sound, according to Knight (2001). In essence, reliability refers to the consistency of grades that are awarded and can be affected by marker consistency, inter-marker reliability and / or test / re-test reliability. Validity focuses on the extent to which an assessment measures what it intends to measure and as such contributes to assessing the things programme specifications, programme learning outcomes and module learning outcomes say are important and of value.

### *3.3.2 Measurement*

One of the main functions of assessment is to provide a measurement of student understanding. This is an argument put forward in Black (1999:118) who suggests summative assessment "serves to inform an overall judgement of achievement, which may be needed for reporting and review". Pelligrino et al (2001:42) support this position proposing that "assessment is a tool designed to observe students' behaviour and produce data that can be used to draw reasonable inferences about what students know". This is normally used as a summative judgement for students and is invariably used in some form of selection, progression or categorisation process. However, there has also been a level of concern regarding the appropriateness of this use of assessment for example, Biggs (1996) suggests that "testing has not always promoted good learning and indeed can have detrimental

effects" and Black and Wiliam (1998), argue that summative assessment is not a particularly good means of finding out what it is that students know.

### *3.3.3 Providing Feedback to Students*

When students participate in assessment – both summative and formative – it provides an opportunity to give feedback to students. The provision of feedback is one of the primary functions of assessment. This is the main theme of the thesis and the discussion on feedback will be returned to in detail later in this chapter.

### *3.3.4 Providing Feedback to Academic Staff*

It is not only students who need to act on feedback. As well as providing an opportunity to provide feedback to students, a further function of assessment is to provide feedback to academic staff. Bloxham and Boyd (2007:21) argue that "for assessment to function in a formative way that supports students' future learning, the findings have to adjust teaching". Black and Wiliam, (1998) suggest that assessment becomes 'formative assessment' when the evidence is actually used to adapt the teaching to meet the needs of students or by the students themselves to change the way they work at their own learning. This argument is supported by Prosser and Trigwell (1999) and Nicol and Macfarlane-Dick (2006). It is argued that the nature of the feedback academic staff provide on an assessment, especially when common problems are identified across a group of students, indicate that students may have difficulty with a particular concept or theory. The 'feedback from feedback' can be used as an indicator that further tuition may be needed or that a different teaching approach to that subject may be required.

### *3.3.5 Accountability of Academic Staff*

A further use of feedback that is generated by academic staff is that can be used as a measurement of the success of the actual teaching. For example Wiliam (2000) suggests that an aspect of summative assessment is to "provide information with which teachers, educational administrators and politicians can be held accountable to the wider public". This argument is supported by Pelligrino et al (2001:42) suggesting that "assessments serve a vital role in providing information to help students, parents, teachers, administrators and policy makers to reach decisions". Black and Wiliam (1998) support the argument that feedback to academics is a function of assessment, suggesting that assessment can be used to provide feedback to shape and develop the teaching and learning activities.

The accountability of academic staff, for example in the argument put forward by Black (1999:118) that results of assessment "may also be used for judging the achievement of individual teachers or of schools as a whole" is a further function of assessment. Using assessment in this way is seen as a means of monitoring standards, as presented by Wiliam (2000) and the standard is then used as a

measurement at individual, module, programme, school, institution, sector, national or international levels.

However there are a number of arguments against using feedback as a measure of accountability of academic staff. Irrespective of whether feedback is used as a measure of accountability there is a more general question about the way in which accountability is established (e.g. Bulloch, Clark and Patterson (2003)). There are many variables which could be used to measure accountability including research publications, success in getting research grants, effective teaching and internal /external service activities (Berk, 2005). The measure of accountability is a complex one and whilst feedback could potentially be one variable it would be too simplistic to base accountability on feedback as a sole variable.

#### *3.3.6 Student Learning*

There is the potential for assessment to provide a mechanism for student learning and to act as a means of enabling student learning during assessment activities (Rowntree,1987). The concept of "assessment for learning" is proposed as a means to encourage student learning (Black et al, 2003; McDowell et al, 2005). There is a counter argument in the use of assessment to encourage learning also raised by Rowntree (1987) who suggest that using assessment to encourage learning may be viewed as an "instrument of coercion" getting students to participate in activities that they wouldn't normally choose to take part in.

## 3.4 Formative Assessment

Formative assessment is different from summative assessment in what it seeks to achieve, as previously indicated in section 3.2. The primary focus of formative assessment (and formative feedback) is to help students understand the level of learning they have achieved and clarify expectations and standards. Yorke (2003:478) suggests that the basic principle behind formative assessment is to "contribute to student learning through the provision of information about performance". Knight and Yorke (2003) promote the use of formative assessment to enhance learning rather than allowing the summative assessment process to drive student learning.

Sadler's (1989:120) discussion on formative assessment focuses on the concept of using formative assessment to improve student learning, "formative assessment is concerned with how judgements about the quality of student responses (performance, pieces, or works) can be used to shape and improve students' competences by short-circuiting the randomness and inefficiency of trial and error

learning". In their study on the emphasis of using formative feedback Park and Crook (2007) suggest that there is evidence to show that formative feedback enhances student learning. Black and Wiliam (1998:61) reviewed nearly 700 research publications on formative assessment, and focussing on the most relevant 250 concluded that "formative assessment does improve student learning". Torrance and Prior (1999) support the assertion that formative assessment is positive and can make a considerable improvement to student learning. Although the assertion that formative activities have a positive impact on student learning and achievement is contested by authors such as Smith and Gorard (2005).

There are many types of formative assessment that can be utilised in the design of formative activities. Examples of typical formative assessment activities include;

- practical exercises;
- tutorials;
- drafts of summative assessments;
- project supervisions;
- group discussions and groupwork;
- student demonstrations;
- student presentations;
- portfolios;
- reflective log books; and
- diagnostic interviews and tests.

There are also a range of formative feedback mechanisms which should be considered in the design of the formative activity. Again the most appropriate to use will depend on the circumstances, but the following list illustrates typical feedback approaches;

- annotated scripts (coursework and examinations);
- feedback sheets;
- marking grids;
- model answers;
- statement banks;
- demonstrations;
- peer feedback;
- tutorials; and
- various e-assessment mechanisms.

The type of formative feedback used will depend on the teaching environment and the circumstances associated with the student group and the specific subject matter being addressed in the formative assessment.

The Assessment Enhancement Group in their examination of formative feedback identified the following factors which will have an impact on the most appropriate type of formative feedback to use;

- size of student cohort;
- the influence of external bodies (such as external examiners, Professional and Statutory Regulatory Bodies (PSRBs), employers);
- the ability to evaluate the effectiveness of the formative feedback on student learning;
- the extent to which formative activities are linked to PDPs.

### 3.5 Self and Peer Assessment

Although self and peer assessment are outwith the scope of this thesis there is a large amount of recent literature particularly on peer assessment. Advocates of peer assessment include Boud (1989), Sambell (1999), Sluijsmans, Moerkerke, Merrienboer and Dochy (2001), McDonald and Boud (2003), and Falchikov (2005) who argue that helping students to understand the assessment process and to develop their skills in self assessment has the potential to increase their understanding of tutor generated feedback.

Research, such as that undertaken by McDonald and Boud (2003) indicates that encouraging students to participate in self-assessment and engage in reflecting on their own learning goals are "highly effective in enhancing learning and achievement". Students will benefit from the feedback that is provided by academics if they have developed skills in self assessment and peer assessment.

Falchikov (2004) suggests that students can be involved in assessment in three distinct areas – namely traditional (and non-traditional) academic activity, performance in academic settings and professional practices. In deciding how to utilise peer assessment one needs to consider the ways in which you wish your students to contribute, remembering that the outcomes from academic activities are products whilst for performance in academic settings and professional practices the outcomes are

processes. Peer assessment can be constructive and helpful in encouraging dialogue but also help in getting students to understand the assessment activities, learn from the assessment and develop constructive and valuable feedback.

### 3.6 Students Engaging with Formative Activities

There is some evidence that the engagement with summative assessment tends to dominate learner behaviour (Yorke, 2003). One of the dangers in letting summative assessment drive the student learning process (Knight and Yorke 2003) is that the students perceive summative assessment activities as their main learning activity to the detriment of formative activities. Students also have a number of conflicting demands on their time, e.g. the need to work through financial pressures, social development ,and/or family responsibilities. If students are working in an environment where there is a large amount of summative assessment and they have a number of additional pressures on their time, then it may be that students need to prioritise their time and as a result only engage in assessment activities where they achieve summative "reward". The conflict in managing time can potentially be exacerbated by cases where students may not see the relevance of formative assessment activities and as a result believe there is even less value in formative assessment. Students may not see beyond the "summative barrier" in order to recognise skills, educational and/or professional development as a significant part of their student experience resulting in a non-appreciation of the value of the formative activity as a learning opportunity.

Black (1999:125) summarises the reasons for student non-engagement as "fear [of participation], failure to see feedback as a positive signal, and negative attitudes towards learning". If formative assessment and formative feedback are to be successful learning tools then there is a need, for students and academics, to appreciate that formative assessment doesn't solely depend on the learning activity and the resultant feedback, but as Black (1999:125) suggests "on the broader context about the motivations and self-perceptions of students".

A different way of examining student engagement with formative assessment is to discuss the opportunity to take risks. In formative assessments students are more likely to try things out because

the consequences of making mistakes are not as high as in summative assessments (Knight, 2001). Race (1994) in formulating his 'ripple model' for learning asked numerous academics and students to describe what helped them learn. The majority highlighted practice; trial and error; having a go and experimenting. He noted that to allow learners to make mistakes in a constructive environment is an essential part of learning.

### 3.7 Use of Feedback

The rationale for considering feedback in the context of Higher Education is that appropriate use of feedback can potentially enhance student learning. However, as well be illustrated in the section on the analysis of the National Student Survey, the feedback provided to students is perceived to be an issue, particularly in terms of quality and in ways to encourage student learning.

If the assumption is made that providing opportunities for learning is one of the key functions of Higher Education then interventions, such as feedback, might contribute to student learning. As indicated in the introduction to this thesis there is a QAA expectation that it is incumbent on HE institutions to "ensure that appropriate feedback is provided to students on assessed working in a way that promotes learning and facilitates improvement". Formative feedback is normally provided by teachers or tutors but can also take the form of feedback provided through peer assessment or be part of a self-assessment or a personal reflective exercise.

The overall perception in the literature is that formative feedback can provide opportunities for student learning in a supportive, constructive and open environment. Hattie's (1987) meta-analysis of what makes a difference to student achievement indicates that the most powerful influence is feedback. Hounsell (2004:5) suggests that formative feedback can accelerate student learning by "enabling students to achieve higher quality learning outcomes than they might otherwise attained, or by enabling them to attain these outcomes more rapidly". Stefani (1998) argues that supportive feedback, both oral and written, when given in a constructive way is a vital element for student learning.

Pellegrino et al (2001:234) suggest that "learning is a process of continuously modifying knowledge and skills" and that feedback is essential to "guide, test challenge or redirect the learner's thinking". Stefani (1998) argues that supportive feedback, both oral and written, when it is given in a supportive and constructive way is a vital element for student learning.

Sadler (1989) noted that feedback is the “key element” in formative assessment but stated that feedback can only serve a formative function when it (feedback) is used to alter the gap between current and the required / expected levels of understanding, an element under student control.

Timeliness of feedback is a common theme in the literature, or more precisely the problem of not getting feedback to students on time. The issues in timeliness of feedback can be exacerbated by the need for the summative assessment process to be robust, reliable and valid. Taking into account the need to assure the summative assessment through means such as double marking, blind double marking and moderation, whilst assuring the assessment measurement also have the result of slowing the process down. Cowan (2003) suggests that research indicates that feedback needs to be provided “within minutes” of completing a task in order to be the most effective. Brown et al (1997) also highlight that feedback is at its most effective when it is “timely, relevant and meaningful”. Regular feedback can be seen to have a positive impact on students’ academic performance. Research undertaken by Tuckman (1999) suggests a link between providing students with regular feedback on academic performance and an improvement in subsequent academic performance.

Quality feedback should be relevant to the formative assessment and to the student learning process (Hounsell, 2008). Quality of feedback can be measured in a number of ways, such as timeliness, relevance, level of information, degree to which feedback encourages student learning and quantity (too little or too much). Nicol and Macfarlane-Dick (2004:11) define good quality feedback as “information that helps students trouble-shoot their own performance and take action to close the gap between intent and effect”. Black and Wiliam (1998) provide evidence that suggests that the “quality of feedback given to learners has a significant impact on the quality of learning”.

However, Nicol and Macfarlane-Dick (2004:11) suggest that a great deal of “feedback information is often about strengths and weaknesses of handed-in work or about aspects of performance that are easy to identify (such as spelling mistakes) rather than about aspects that are of greater importance to academic learning but that are more abstract and difficult to define (such as strength of argument)”.

Another aspect associated with the quality of feedback and the opportunity to enhance learning is to use the comments as feedforward. A number of authors for example Cowan 2003, Race 2005, Knight, 2006, Duncan 2007 advocate the use of feedforward. Knight (2006:446) suggests that

feedforward is “information intended to help the student do better on a similar type of task in the future”.

The literature on formative assessment and formative feedback suggests that the provision of good quality feedback which will enhance student learning is not an easy thing to do. It is not always the case that students benefit from feedback or indeed learn anything from feedback.

### 3.8 What Students do with Feedback

Rust (2002) indicates that a review of research literature suggests that “just giving feedback to students without requiring them to actively engage with it is likely to have only limited effect [on student learning and understanding]”. One of the problems with formative feedback is that it is often the case that students fail to recognise it as helpful (Tunstall and Gipps, 1996). Some of the literature on feedback suggests that many students don’t really want feedback at all. Some (Hounsell, 1987; Ecclestone, 1998) suggest students usually don’t read feedback. Others (Ding, 1998; Adams, Thomas and King, 2000, Duncan, 2007) conclude that many students only want a grade or mark.

If students are to enhance their learning from feedback then it is important that they know what to do with that feedback – much of the literature suggests in order to get the most from feedback students need to understand the assessment process and have skills in self assessment. Lea and Street (1998) suggest that a great deal of the feedback provided for students is often not understood by the students. Glover and Brown (2006:12) summarise the understandability issues in that “such failure [failure to understand feedback comments and / or assessment criteria] inhibits the possibility of any feedback being used in a formative manner”. Lea and Street (1998) suggest that students often have difficulty in understanding feedback (either in terms of language used or in relation to the tasks the students have undertaken) and are not always able to use the feedback to enhance their learning. Havranek (2002) explores the importance of using appropriate language in feedback in order to facilitate student understanding. Nicol and Macfarlane (2004:4) argue that “any model of feedback must take account of the way students make sense of, and use, feedback information”. Sadler (1989) indicates that in order for students to appreciate feedback and construct actions to deal with the feedback they need to “possess some of the same evaluative skills as their teacher”.

Hall and Burke (2003:10) suggest that if students “know what to do to improve they can “close the gap” between what they can do or know and what they need to do or know”. Hall and Burke go on to

argue that “it is better to focus on causes of success and failure than to praise performance on the basis of the final product or completed task”. Providing feedback which allows students to “close the gap” is part of what Yorke (2003) alludes to in his discussion of feedback changing student behaviour. Feedback that is provided for students should address complex learning issues, such as addressing quality of argument, completeness of discussion or interpretation of literature, rather than focus on simple feedback such as exceeding word count or spelling and grammar.

As indicated in the previous section, one of the aspirations in the production of written comments is that students will use these comments as feedforward. There are a number of conditions that need to be met in order for students to use comments as feedforward – the comments need to have some feedforward value, but there also needs to be some connection between different modules and / or between different levels in a programme of study if students are to use comments as feedforward.

There is a problem with formative assessment in that it is often the case that students fail to recognise it as helpful (Tunstall and Gipps, 1996), or do not even realise that they are getting formative feedback. A comprehensive study conducted by Maclellan (2001) revealed that students generally view the feedback process as “only sometimes helpful”, with 30% in Maclellan’s study indicating that feedback never helps them to understand”. The issue of students not understanding feedback has been raised widely in the literature (Chanock, 2000; Higgins et al, 2002; Weaver, 2006). Maclellan goes on to suggest that her findings indicate that there is a discrepancy between students and lecturers as to what constitutes helpful feedback. Much of this discrepancy in perception centres around the way feedback promotes discourse and discussion – 63% of lecturers thought that feedback prompts discussion between student and teacher whereas only 2% of students responded positively to the same question. Indeed 50% of students suggested that feedback never prompted discussion. Mirador (2000) argues that one way to examine whether or not there is a match between tutor intentions and student perceptions is to focus on the feedback given to students.

### 3.9 Feedback and Dialogue

It is suggested (Black and Wiliam,1998) that one of the main issues in formative activities is that if feedback is to have any effect on student learning, the learner has to respond to the feedback. The literature indicates that it is important that students have the opportunity to reflect on their learning and discuss their learning needs, (Black, 1999; Black and Wiliam 1999; Juwah, McFarlane-Dick, Matthew, Nicol, Ross and Smith 2004; Hyatt, 2005; Gibbs, 2005).

The previous section indicated that there is a body of evidence in the literature which indicates that students do not always engage with feedback. When they do engage with feedback they don't engage in the way academics expect them to, and often when they try to engage with feedback the students don't understand what is meant by the feedback. There is also a suggestion in the literature that the provision of formative feedback provides an opportunity to enter into dialogue with students about their formative activities and discuss their learning needs (Black, 1999; Black and Wiliam 1999; Nicol and Macfarlane-Dick, 2004; Juwah et al 2004; Hyatt, 2005; Gibbs, 2005). Nicol and Macfarlane-Dick (2004:7) suggest that "feedback as dialogue means that the student not only receives initial feedback but also has the opportunity to engage the teacher in discussion about that feedback". Knight (2001:8) suggests that consideration of dialogue can be built into the design of the assessment - "good formative assessment means design learning sequences that afford plenty of opportunities for good learning conversations arising from feedback".

Encouraging students to discuss their feedback with tutors or with other students is one potential way to tackle the issues of understanding, or misunderstanding associated with feedback. Students not understanding the feedback they have been provided with is one of the issues with feedback in Higher Education (Chanock, 2000; Higgins et al, 2001; Weaver, 2006). In order for students to benefit from formative assessment and formative feedback one of the ways to address the misunderstanding issue is to provide students with an opportunity to express and communicate their understanding of the feedback that they receive. Nicol and Macfarlane-Dick (2004*:6*) suggest that "one way of increasing the effectiveness of external feedback and the likelihood that the information provided is understood is to conceptualise feedback more as a dialogue rather than as information transmission". Entering a dialogue or discussing feedback may well be a way of enhancing learning through feedback irrespective of whether there is an issue about understanding or not. Higgins et al (2001) argue that academics need to "pay more attention to feedback as a process of communication".

### 3.10 Feedback on Examinations

In many institutions there are particular issues regarding feedback on examination scripts both in terms of the timing of examinations – normally at the end of module or end of year, but also as a result of university regulations prohibiting the return of examination scripts to students. The Data Protection Act (1998) and Freedom of Information Act (2000) mean that the requirement to provide students with feedback on examinations is likely to evolve in the future.

A pilot study undertaken by Cox (2009) found that from 20 institutions surveyed 18 had a policy that examinations were the same as other forms of summative assessment in that students should receive feedback on their work. However the main difference between examinations and other forms of summative assessment is that students are not allowed to take their exam scripts away from the institution as the exam paper is required for external examiner scrutiny.

There are pragmatic difficulties in getting feedback on examinations to students, mainly as a result of timing and end of year assessment, but it potentially means that there is a significant amount of summative assessment where there is no feedback provided to students. This may well have an adverse impact on students who are referred in the examination (the need to resit the examination in August / September after a June / July potentially without knowing where they made mistakes or how to 'close the gap' in their knowledge before the resit examination. Similarly students progressing into the next year may lose out on any feedforward opportunities.

### 3.11 The Feedback Stakeholders

There is a danger that academic staff produce feedback for students because there is a perception that the production of feedback is part of an academic's job and the academics end up producing the feedback as a contractual obligation rather than as a means of enhancing student learning. Part of the issue may arise because there is an institutional expectation that feedback on assessment is produced as part of a learning and teaching strategy, as part of the academic workload allocations or to be used as evidence for external examiners or external review. Duncan (2007) found that some of the feedback was not actually addressed to the student but to internal and external examiners making its usefulness to student learning less apparent and less obvious. Maclellan (2001) has also found that there are occasions when written feedback on student work has only been put on the coursework or exam paper in order to justify the mark that students are given. The justification is often not for the student but for the external examiner and other external evaluators such as the Quality Assurance Agency.

It is also important to consider who feedback is provided for. An example illustrates the potential differences in the interpretation of feedback between two different stakeholders –consider the

potential feedback from students about the feedback on a piece of coursework and the interpretation of the same feedback from an external examiner.

External examiners may consider the feedback to be excellent because:

a) it is there,
b) it indicates that the work has been marked fairly and consistently (indicator of assessment reliability), and
c) it maps the student success against a series of learning outcomes

On the other hand student comments on the same feedback could conceivably be:

a) don't know didn't get any feedback – they said my work was given to the external examiner !
b) didn't understand any of the comments about learning outcomes
c) feedback was fine, but I needed it much earlier, before I sat my end of module examination

### 3.12 Formative Assessment and Technology

A large amount of literature over recent years has identified, examined and evaluated the use of technology to facilitate and / or support assessment. There is a general perception that the use of educational technology and e-learning makes teaching in HE more efficient and enhances the student experience, (summarised by Masi and Winer (2005:150) indicating that there is an "intuitive sense that what teachers and students can do with technology is 'better' than what can be done without it"). Educational technology and tools to support e-learning are part of the environment in HE and in many ways contribute to the challenge of the traditional teaching functions of the HE sector. Educational technology can be applied to enhance formative assessment and feedback activities, summarised in Brown, Race and Bull (1999) who suggest three main benefits accrue from the integration of ICTs into assessment and feedback activities, namely through:

- reducing the load on teachers by automating appropriate parts of the task of marking students' work;
- providing students with detailed formative feedback on their learning much more efficiently than is usually possible with traditional assessment;
- bringing the assessment culture experienced by students closer to the (computer based) learning environments with which they are increasingly familiar and confident.

ICTs in Higher Education have been around for a long time – from the Flowers Report (1965) progressing to the Dearing Report (1997), through the Joint Information Systems Committee (JISC) initiative (1999) and culminating in the 2003 White Paper which suggests that e-learning should be embedded in "a full and sustainable way by 2013", (2003:64). HEFCE's (2005) stated goal in the recently published e-learning strategy is to "help the sector use new technology as effectively as they can, so that it becomes a 'normal' or embedded part of their activities".

The government (White paper and other HEFCE docs); educational managers (Ramsden 1998); technology advocates (Laurillard, 2002; Salmon, 2000, 2002; Collis and Moonen, 2001; Conole and Oliver, 1998; Jochems, Merrinënboer and Koper, 2004) and commercial organisations (WebCT and Blackboard for example) all enthuse about the use of ICTs and e-learning and the opportunities afforded by exploiting the potential of educational technologies and e-learning. Ramsden (1992:5) argues that technology is helping change the nature of university teaching as a method for imparting knowledge to an environment that "makes student learning possible". However George (2002) cautions that "IT is an enabler, not a solution in itself" and McGettrick, Boyle, Ibbett, Llyod, Lovegrove and Mander (2004) suggest that "despite advances that are being made in relation to its uptake, there are many who strongly believe that the effectiveness of e-learning remains one of the 'grand challenges' for education in the coming decades".

National strategies and policies for the HE sector and in particular the role of ICT to support learning, teaching and research, sit within a context of rapid technological change (Conole 2001). Educational technology and tools to support e-learning are part of the environment in HE and in many ways contribute to the challenge of the traditional teaching functions of the HE sector – and this may well be the case in formative assessment and formative feedback.

Throughout the evolution of educational technology and e-learning very little time or effort has been given to examining the effect using ICT or the demands of e-learning has on teachers in HE. Research that has been undertaken on the impact of technology tends to focus on the secondary school sector and tends to focus on adoption and usage of ICTs (using metrics such as ratio of student to computer or the implementation of a physical infrastructure) or the lack of change in teaching practice as a result of ICT implementation (Cuban 2001; Curran, 2001; Pelgrum 2001) – suggesting traditional approach but using ICTs.

There is a need for academic staff to invest time in developing the appropriate technical and pedagogic skills required to make best use of ICTs. Similarly there is a need for a robust technical infrastructure to support the use of the ICTs.

ICTs can reduce the workload for academic staff and potentially remove some of the constraints which make formative assessment and formative feedback impractical. ICTs can be used to act as an automated tutor in order to extract features of student responses and analyse those responses to identify errors and provide feedback for correcting those errors.

The use of ICTs in formative assessment potentially allows for the provision of effective and efficient feedback which can be individualised and be provided in a timely manner. Charman (1999) argues that ICTs “could engage students even if there was no summative element involved” and that "there is mounting evidence for the pedagogic advantages of CBA [computer based assessment] in providing feedback on student work in Higher Education." ICTs are not limited to numeric, mathematical or scientific exercises but can be used across a range of subject domains. When ICTs are used in formative assessment and formative feedback, academic staff should be aware of the need to consider students’ perception of ICTs and their skills and abilities in using ICTs. Laurillard (2002) advocates the need to use appropriate pedagogy in the use of ICTs in learning and teaching, and it is certainly the case that pedagogic considerations are required to be taken into account in the use of ICTs in formative assessment and feedback.

Utilising ICTs in formative activities can potentially provide a number of pedagogic benefits for students, including:

- Improved flexibility in that students can participate at their own pace and undertake the activities when they want to and even undertake the formative activities on multiple occasions;
- Adaptive testing can be used in order to match the formative assessment to individual student’s ability;
- Automated and immediate feedback (Denton 2001);
- The opportunity to monitor their own progress and development; and
- The opportunity for students to participate in formative dialogue (Boud and Knights, 1994; Lea, 2001).

### 3.13 Chapter Summary

In this chapter the literature on assessment and feedback has been critically reviewed and used to shape the design of the research study – discussed in chapter 4. There are a number of common themes that can be derived from the literature and these have been used in shaping the research design.

The purpose of assessment has been critically analysed and the issues associated with assessment in Higher Education have been discussed.

The concept of feedback has been critically evaluated based on a review of the literature. The review of the literature on feedback and the conclusion that there has been very little research into the impact of feedback on student learning contribute to the rationale for studying feedback in this thesis.

Consideration of how students engage with formative activities has been presented in this chapter, and the issues associated with engagement, or lack of engagement, have been introduced. Student engagement with feedback will be returned to in chapters 5 and 6.

The nature of dialogue around feedback and the potential benefits associated with dialogue have been introduced. The student perception of dialogue on feedback will be returned to in chapter 6 in the discussion on focus groups.

This chapter has also considered the use of technology and particularly Information and Communication Technology (ICT) in the provision of feedback. The rationale for keeping ICT and feedback outwith the scope of this thesis has been put forward.

## Chapter 4 Methodology

### 4.1 Introduction

The purpose of this chapter is to discuss the research question – "*Can formative feedback enhance student achievement ?*" – in detail, outline the various stages undertaken in the thesis and justify the methodology adopted in order to obtain the data to be used in analysis and discussion of the research question. The research question was derived from recourse to the literature as discussed in chapter 3 which indicated the use of formative feedback can support and potentially enhance student achievement and student learning.

In line with the nature of a professional doctorate an action research approach was adopted in order to provide evidence to review practice, determine the impact of practice and reflect on how that practice was used to affect change in practice. Lee (2009:6) argues that professional doctorates allow for the "development and/or application of expertise directly in the practice setting". The context for this thesis was the author's place of work. The overall ambition was to critically evaluate developments and innovations in the provision of feedback and consider the success (or otherwise) of application of feedback in academic practice, using an action research approach coupled with ethnographic case studies. According to Tennant (2004) professional doctorates should attempt to link doctoral education with work related challenges and questions. The action research design that has been used in this thesis sought to make the link described by Tennant. This was approached by interpreting the theoretical discussion on feedback from the literature (discussed in chapter 3) reviewing and evaluating practice and considering potential changes to practice and implementing practices designed to address the issues associated with the provision of feedback.

The action research approach (McNiff and Whitehead, 2006) was adopted in an attempt to improve education practice and to contribute to knowledge about educational practice in terms of impact of feedback. As the provider of feedback and the creator of the feedback interventions studied in this thesis the author's role was such that the information gathered in the thesis could inform future decisions and actions at individual and departmental levels.

The grand ambition of this thesis was to examine the issues surrounding student perceptions about the provision and use of feedback (or lack of feedback), to explore ways in which feedback might be improved so as to improve student learning and achievement and to provide a strategy for change of practice at a local level. The motivation behind the thesis was to use the findings in order to promote

and affect change in practices associated with the provision of feedback from an individual perspective and at a departmental level.

A variety of data from a number of different sources including student marks, discussion group meeting notes and feedback forms were examined for salient concepts in relation to the research questions. The gathering of data for the thesis, whilst aimed at providing evidence for individual improvement was also gathered so as to inform arguments to affect change at departmental and perhaps extend to the author's own institution. A further aspiration was to use the findings from this thesis as an example to share with the wider computing community in Higher Education in the UK.

In order to support the action research in this thesis a process of gathering qualitative and quantitative data via case studies was adopted. The rationale for case studies and the design of the case studies is discussed later in this chapter.

## 4.2 Structure of Research

In this section the structure of the research is introduced. Action research is the main approach that has been adopted. The action research has been underpinned by case studies. Examination of the interventions was extended over an extended period in order to obtain a longitudinal picture. . Essentially the structure is as follows:

- an initial study to determine the important variables associated with feedback,
- a case study with first year students (running over a period of 3 years) comparing cohorts (3 different cohorts over 3 years) of students who had access to formative feedback with cohorts (again 3 different cohorts over 3 years) of students who didn't receive formative feedback,
- a second case study comparing second year computer forensic students studying modules where the modules had different approaches to feedback. The second year case study was repeated over 2 years.

In both case studies a number of formative interventions were introduced (details of the interventions are provided in chapter 5). Quantitative data were gathered on summative student performance. Qualitative data were gathered at various points in time through discussion groups. A chronological picture of the study, which outlines the structure of the research, is provided in Figure 4.1.

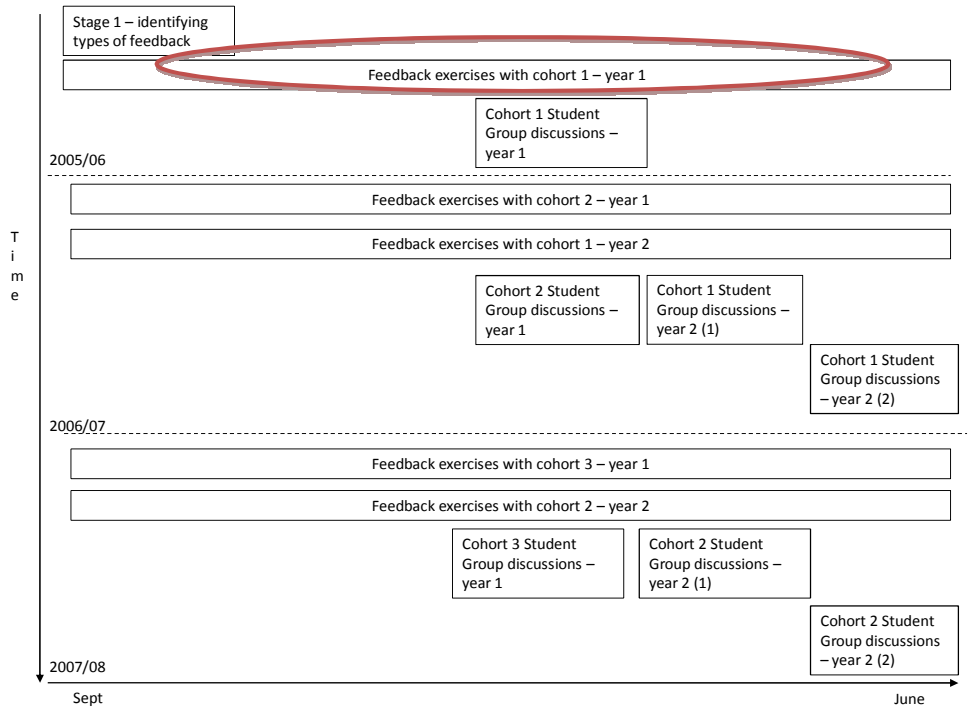



*Figure 4.1 Schematic of chronology*

The schematic shown in the figure above is intended to illustrate the chronology of the various activities carried out in the action research for this thesis. The figure shows the activities across the three years of the data gathering period and the sequence in which the activities occurred. Each box in figure 4.1 has action research activities associated with it, either formative feedback activities as part of the case studies or discussion activities in the discussion groups. The detail of the activities in the boxes is discussed in chapter 5. However, as an example, the feedback exercises case study (the ringed box in figure 4.1) is “exploded” and illustrated in figure 4.2 below to show the empirical nature of the action research activities. The schema for the computer science students (the control group in case study 1) is provided in figure 4.3 to illustrate the difference in formative activities between the two student groups.

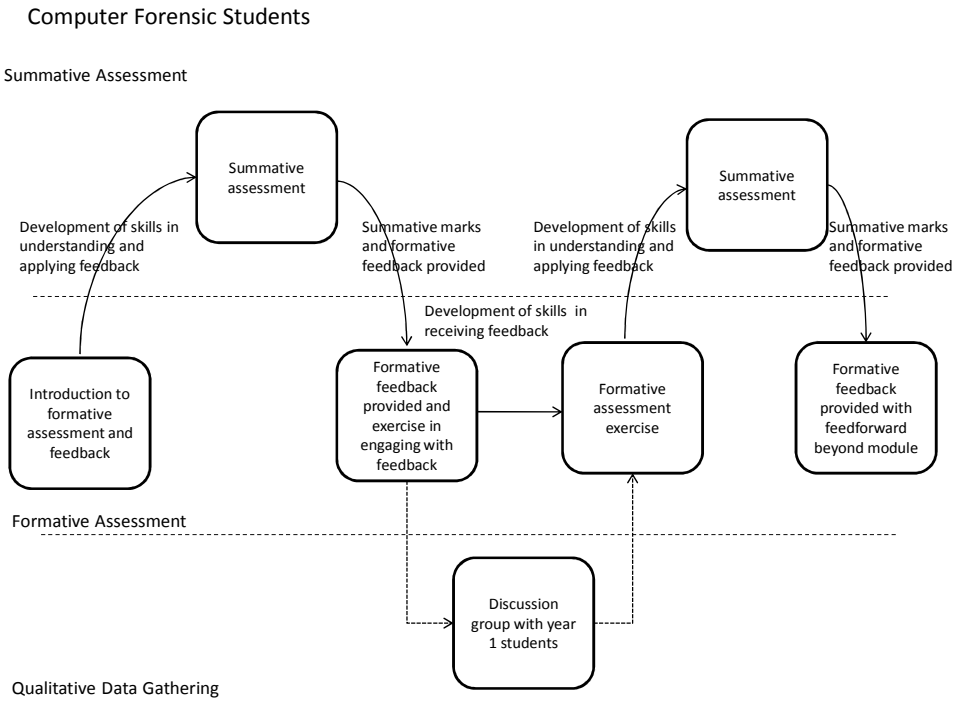



*Figure 4.2 Detail of Case Study 1 Activities for Computer Forensics Students*

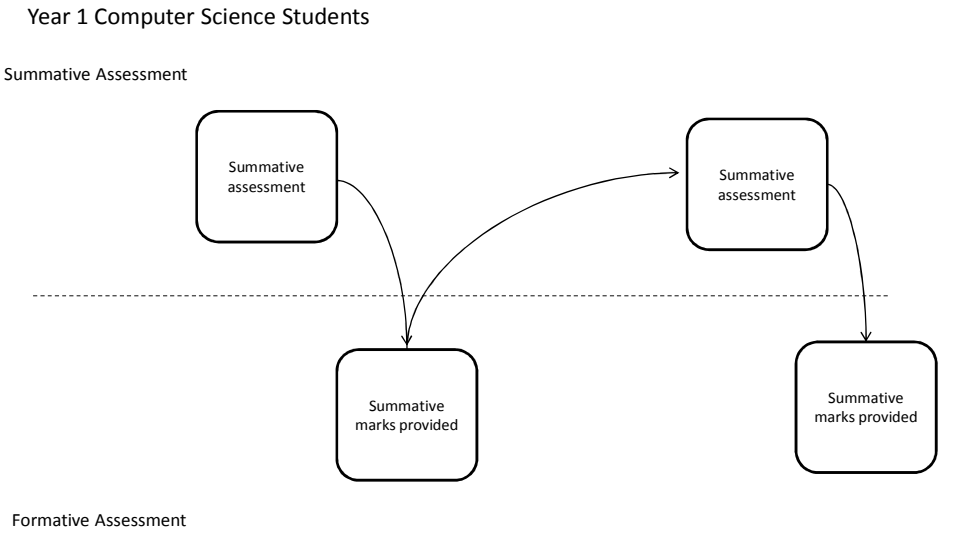



*Figure 4.3 Detail of Case Study 1 Activities for Computer Science Students- illustrating lack of feedback*

Figures 4.4 and 4.5 illustrate the nature of the model of intervention in case study 2. Case study 2 examines the second year activities in the computer forensics programme where one of the computer forensics modules includes formative interventions and the other computer forensics module does not.

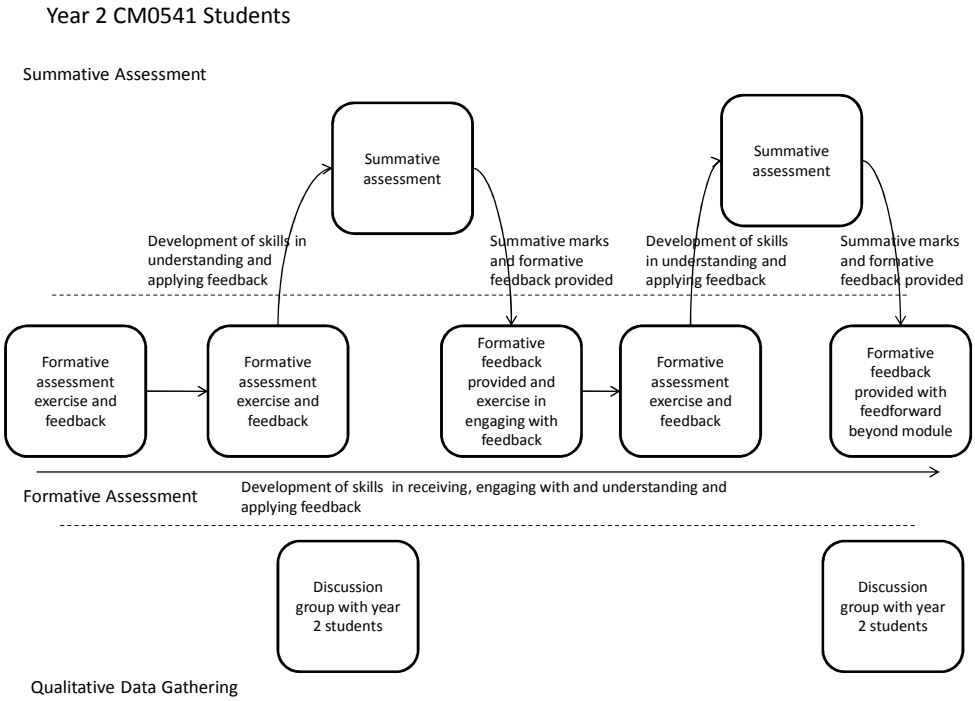



*Figure 4.4 Detail of Case Study 2 Activities for Computer Forensics Module CM0541 (including formative interventions)*

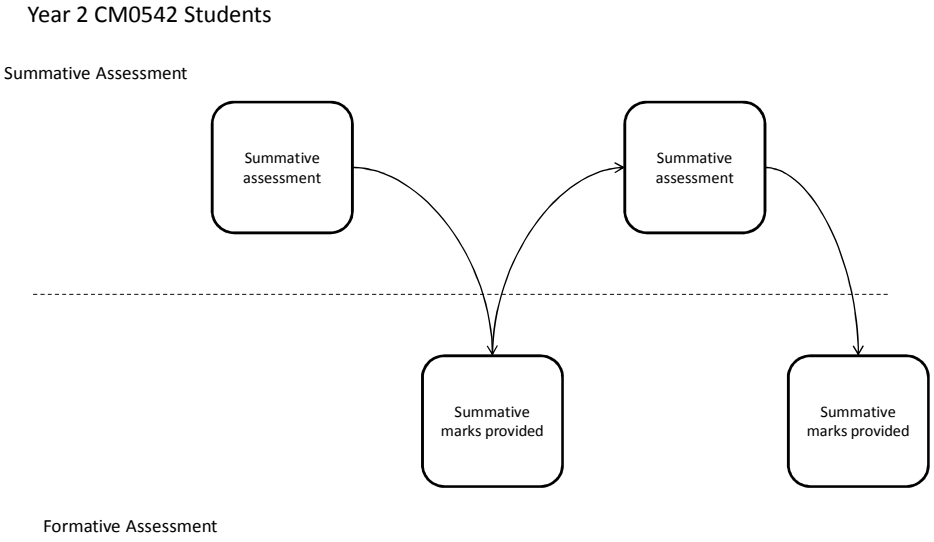


*Figure 4.5 Detail of Case Study 2 Activities for Computer Forensics Module CM0542 (no formative interventions)*

The discussion on the case studies is provided in detail in chapter 5. However, the figures 4.4 and 4.5 above are included at this point in order to provide an indication of the structure of the formative interventions and the differences in feedback provision between the computer forensics students and the computer science students in the first year and between the two different computer forensics modules in the second year of study. As indicated in figures 4.2 and 4.3 a pretest posttest control group model was utilised in order to try to determine the impact of feedback. The computer science students formed the control group who received little or no formative feedback and the computer forensics students were the group who received formative feedback throughout their studies.

## 4.3 Input from Literature

Reviewing the literature on assessment and feedback it can be seen that there has been very little research into the impact of feedback on student process of learning or the impact of feedback on student achievement, especially in Higher Education. Similarly there has been little consideration given to the ways in which students engage with formative activities or formative feedback in Higher Education. The lack of research in this area is even more apparent in Computer Science.

As indicated in the review of the literature in chapter 3, there is an overall perception that formative feedback is of potential benefit to students. This is summarised by Black and Wiliam's (1998) review claims to demonstrate that formative assessment can improve student learning and achievement. On the other hand Askew and Lodge, (2000) take issue with Black and Wiliam's claim and argue that there is little correlation between formative feedback and enhancing student achievement. This thesis examined the hypothesis that formative feedback has a positive impact on student learning and achievement. The intention was to use the results from the thesis to inform teaching practice and to use the results either to reinforce current practice or to provide evidence for a change in practice. There are a series of related questions linked to the question of improvement in the student learning experience and student achievement.

## 4.4 Research Question

The primary research question is – *Can formative feedback enhance student achievement?*

There is a range of potential responses to the research question on the impact of formative feedback on student learning. To simplify, potential levels of impact include:

- Formative feedback has no effect ;
- Formative feedback has a positive effect ; or
- Formative feedback has a negative impact on student learning and achievement.

The subsidiary questions related to the primary research question are identified in this section. The subsidiary questions focus on which aspects of student learning (if any) can be improved as a result of formative assessment and feedback and how these improvements can be measured. The subsidiary questions addressed in the thesis in conjunction with the main research question are:

- Why do students want feedback ?
- What students do with the feedback provided to them ?
- How do students use feedback to enhance learning ?
- What do students think is useful feedback ?
- Can the case study material from this thesis be used to promote change in academic practice ?, and
- Can student performance be improved by the provision of feedback ?

These questions, along with the main research question are considered throughout the thesis and are an integral part of the research design. The questions are discussed in detail in chapters 5 and 6. A set of preliminary issues around the nature of student achievement need to be addressed first.

Student achievement in this thesis is taken to be some form of summative measurement at an end point. The end points used include individual assessments in modules, module marks and end of level grades. There are many other potential measures of student achievement including exit velocity, self development, self perception or employability. These measures of achievement are outwith the scope of this thesis.

### 4.5 Research Design

As indicated earlier in this chapter the grand ambitions of this project were to enhance student learning and improve student achievement through improving feedback and encouraging change in academic practice so as to embrace and embed the factors which enhance feedback. The role of developing others in Higher Education can be tackled in a variety of ways (Land, 2001) but implementation always requires a balance of research or evidence based activities and communication. In order to provide the evidence to encourage change an action research approach was chosen as a method. The action research approach was supplemented with the use of case studies in order to explore and illustrate the feedback issues. The material presented in this thesis derives from a very small set of case studies and there are issues in generalising the findings across the wider context of Higher Education or even similar subjects in different institutions. However, despite issues of generalisability it was hoped that the findings from this study could be used to inform the author's future practice for subsequent cohorts of students. In addition it was also hoped that the findings of this study could be shared with colleagues to encourage them to consider and reflect on their assessment and feedback practice.

In this section the design of the research process and a justification of the methodology to be used in order to address the research question(s) is discussed. In articulating the research design the author attempts to achieve a pragmatic and workable research plan which will be suitable for the critical analysis in the domain of formative feedback, whilst at the same time maintaining the educational research principles of validity and reliability (as applied to qualitative rather than quantitative research).

The research design was set in the context of the continuously changing environment of Higher Education and the even more rapidly changing subject domain of computing and computer forensics, as well as the author's change in Higher Education institution (from Northland University to Southland University) during the period of research.

### *4.5.1 Subject Domain of the Research*

The first decision as part of the research design was whether to set the research within the context of the author's subject discipline of computer science and computer forensics or to attempt to critically analyse the impact of formative feedback on student learning in a more generic Higher Education environment. .

The rationale for choosing to focus on a comparison of computer science and computer forensics studying in year 1 and computer forensics students studying in year 2 was based on a number of factors. The fact that the research methodology was an action research methodology meant that the subject domain by necessity had to be one in which the author participated as a teacher as well being one where the author had easy access. Reflection on the author's teaching practice is an integral aspect to the ethos of the professional doctorate.

The rationale for choosing the environment for the research was based around the pragmatics in terms of access to students and a manageable size of study. It is accepted that the participants used in this research are a convenience sample (see section 4.6.2 for discussion on sampling).

A further factor influencing the choice was the author's subject knowledge of both computer science and computer forensics and knowledge of the academic structures and operation of academic departments examined in the action research.

There were issues in the choice of subject domain. The issue of generalisabilty has already been alluded to but in some respects the ability to generalise does not matter in the context of this study since the objective was to reflect on the author's teaching practice and to encourage change in practice in one department in one institution. However it should be remembered that the study was based on only one subject discipline area (computer science and computer forensics are both in the computing subject discipline as indicated in the subject benchmark (QAA, 2000 and 2007). It was not the intention, at this point in time, to extrapolate the findings from the small case studies to the wider HE environment in computing or to generalise the findings from the computing subject domain to all HE. Given the sparseness of the evidence on feedback in Higher Education it is hoped that this study will contribute to the emerging corpus of results.

The case studies looking at the computer forensics and the computer science students is exactly the groups of people that the author was interested in from the angle of professional practice. By examining these groups and not attempting to generalise provided the opportunity to explore the issues in greater detail. Had a random sampling approach been used to create the study groups there would have been much less control over the environment.

### *4.5.2 Ethics and Bias*

It was accepted in the design of this research that the role of author may have produced a level of bias in this study since the author was teaching the students and the author was in a position of teaching authority. However, from the outset, students were informed about the research into feedback, the planned project and the rationale for the project in terms of seeking to improve their learning experience. All students were informed about anonymity, confidentiality, the opportunity to not participate in the research and the opportunity to withdraw from the research at any point in time.

There were also issues around the role of the author as a manager in education. However, as has been discussed in chapter 2 in the management of change, irrespective of the author's managerial position, there was a need to be able to convince colleagues, through examples, of the benefits of reviewing and changing teaching practice.

### *4.5.3 Action Research*

An action research approach was selected for the research design in order to develop an understanding of the practice of providing feedback to students and the ways in which students used the feedback. Action research was selected as a means to carry out the research because the focus of the research was in the author's institution and in the first instance the author wanted to focus on his own professional practice in the provision of feedback. McPherson and Nunes (2004) advocate the use of action research in the analysis of student learning and this lends itself to the research in this thesis. Action research by its very nature does not have a fixed methodology but there are philosophical underpinnings which can be grouped into critical, participative and qualitative (Waterman, Tillen, Dickson, and de Koning, 2001).

The design of this thesis attempted to embrace all three of Waterman's suggested groupings;

- Critical – through the use of literature to inform the research design;
- Participative – through reflection on the author's own practice, with the author acting as a participant; and
- Qualitative – with data gathered via a series of discussion groups

In addition the opportunity for action research approach to facilitate change was taken into account when selecting an action research approach. Cohen, Manion and Morrison (2000) advocate action research as a powerful tool for change and improvement at a local level.

The action research methodology guided the implementation of the interventions (and case studies) considered in this thesis. According to Kemmis and Wilkinson (1998:24) action research "involves learning about the real, material, concrete, particular practices of particular people in particular places". Action research, according to Kemmis and McTaggart (1988:5) is a form of "collective, self-reflective inquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices as well as their understanding of these practices and situations where these practices are carried out". Waterman et al (2001:11) define action research as a "period of enquiry that describes, interprets and explains social situations while executing a change intervention aimed at improvement and enhancement". They go on to suggest that action research is "problem-focused, context-specific and future-oriented". Somekh (1995) suggests that action research methodologies will vary depending on the previous experience of the researcher themselves.

Regan and Besemer (2009:212)) indicate that "generalisability is not the prime concern of action research, although the results are often of interest to a much wider audience than merely the practitioners involved". Bassey's (1995:111) discussion on action research stresses the "uniqueness of each research situation" and the value of the study of singularity rather than emphasis on the notion of creating a generalisable theory. Whitehead (1989) argues for the particular importance of action research to research into education practice. Whitehead describes education as a value-laden activity where the term "value" refers to those qualities that give meaning and purpose to the professional lives of practitioners and he suggests that by asking questions about how practices can be improved, practitioners can embody their own professional values.

### *4.5.4 Case Studies*

In order to underpin the action research carried out in this thesis an ethnographic case study approach was selected as a method for in-depth analysis of the impact of formative feedback on student learning and achievement. The rationale for selecting case studies as a method to support the

action research was based on the strengths of the use case studies in educational research. The justification in selecting case studies as a method was based on the definition of case studies being a "specific instance that is frequently designed to illustrate a more general principle", Nisbet and Watt (1984:72) and Cohen, Manion and Morrison (2000:181) argue that case studies provide a "unique example of real people in real situations, enabling readers to understand ideas more clearly than simply presenting them with abstract theories or principles". Cohen et al (2000:181) go on to suggest that case studies can "penetrate situations in ways that are not always susceptible to numerical analysis". The most important factor in choosing case studies however was the ability of the use of case studies in educational research to establish cause and effect. In order to understand the cause and effects associated with provision of feedback and the impact on student learning case studies provided a framework which allowed the author to identify, and then examine, the issues in depth. One of the main arguments for using case studies in the research for this thesis is "that they observe effects in real contexts, recognizing that context is a powerful determinant of both causes and effect" (Cohen et al 2000:181). Using these arguments it was hoped that the thesis objective of providing data to encourage change in practice would be realised by the presentation of results from the case studies.

Another important aspect of cases studies which made them appropriate for this thesis is Hitchcock and Hughes' (1995:316) claim that "case studies are distinguished less by the methodologies that they employ than by the subjects / objects of their inquiry". The complexity of the situation being analysed in the action research justifies the use of case studies.

There are many arguments against the use of case studies, including the fact that results might not be generalisable; results will not be easily cross checked and in turn may therefore be selective, subjective or biased; and the case studies are of course prone to observer bias. Whilst it was accepted that it would not be possible to generalise from the research in this thesis it was hoped that the opportunity to penetrate the situations afforded in the case studies and uncover examples of cause and effect would outweigh the concerns about generalisation. The concerns around generalisability were taken into account in the analysis of the findings and are discussed in the context of validity and reliability later in this chapter.

In qualitative research in general and in the research design utilised in this thesis in particular, the opportunity for replication is minimal, which may raise questions regarding the reliability of the research. However, this is countered by the opportunity to "include the uniqueness and idiosyncrasy of situations and that the [case] study cannot be replicated" (Cohen et al 2000:119). It would be possible to test for replication by asking others to provide feedback of the same sort, but this activity is beyond the scope of this study.

### *4.5.5 Sampling*

The research design decision to analyse case studies meant that sampling had to be take into account. The sample for the case studies is three year 1 cohorts of both computer forensics and computer science (6 student groups) and two year 2 computer forensics cohorts (2 student groups).

Ball (1993:37) suggests that “in educational research, especially research in complex educational organisations, sampling is inevitable and necessary”. Smith (1975:105) endorses the use of sampling in education research as the “search for typicality”. Cohen and Manion (1994:86) support the use of sampling by suggesting that “in a large survey researchers usually draw a sample from the population to be studied; rarely do they attempt to contact every member”. However, Ball is concerned that the consequences and implications of sampling are “too often ignored by fieldwork” and this would be a weakness in the sampling in this thesis if the intention had been to make generalisations from their sample of computer science and computer forensics students. However, the intention in this study was to be able to identify issues which would support change in the author’s practice, but also be generalisable to future cohorts of students taking the same modules in future years. As has been indicated earlier it was not the intention to make generalisations from the research undertaken in the thesis. The sample chosen was a convenience sample in that the selected students had been taken from the cohorts studying computer science and computer forensic at one institution. However, it is plausible that this is typical of students on similar programmes of study in future years in the same institution, and in similar institutions now and the in the future,

The sample in this thesis was composed entirely of those studying computer science and computer forensics at one institution and as such is a “convenience sample”, defined by Diamantopoulos and Schlegelmilch (2000:14) as the situation where “sample members are chosen on the basis of their being readily available or accessible”. However, the convenience sample is justified because this is the target group that the author is interested in studying.

### *4.5.6 Gathering the Quantitative Data*

The purpose of this section is to discuss the research instrument, i.e. how primary quantitative data were collected from the case studies. The case studies were used in attempt to gather measurable data on the experience of formative feedback on computer forensics and computer science students and on the impact of feedback on student achievement.

The original idea had been to use statistical data to measure the effect of formative feedback on student learning by comparing an experimental group against a group who had similar academic learning requirements but different opportunities for formative feedback and different formative interventions.

The methodology employed in the thesis was intended to determine the effect of formative feedback by examining students' perception of feedback, perception of learning and summative assessment achievement of a group who have been provided with formative feedback and a group who have not. The second group acted as a control group.

The initial data for the thesis were gathered from students in the School of Computing Engineering and Information Sciences (CEIS) at Northland University (at the time of data gathering the author's School and Institution) as an ethnographic case study in order to examine the possible improvement in student achievement afforded by the provision of formative feedback.

The initial data gathering included all undergraduate computing students in the School (population – 482 students) in order to get a "baseline" view of how students across the School perceived and valued feedback. The initial data gathering attempted to get an indication of what was important in terms of feedback for students in CEIS.

The case studies in the action research involved groups of students, who had equal (or at least very similar) educational experiences. The study compared students on the first year Computer Forensics (CF) programme (high levels of formative feedback) with students on the Computer Science (CS) programme (lower levels of formative feedback). The intention was to look at the summative performance of computer forensics students and compare the summative performance on modules where a strategy of formative feedback was employed against other computer science modules where feedback was not provided. The CS cohort acted as a control group that didn't have exposure to formative feedback. Comparison was also made on the summative performance of CF students on CF modules and on the CS modules that they took. Data were gathered to facilitate analysis of the level of improvement (or otherwise) in student achievement as a result of formative feedback.

The first two computer forensics cohorts from 2005/06 and 2006/07 were studied in further detail, as a further case study, in their second year in 2006/07 and 2007/08.

In general terms the CF group had the opportunity to undertake a formative assessment task then were given formative feedback. After they received the formative feedback from the first formative assessment task they undertook a second formative assessment task). The computer science group undertook an assessment task but received no formative feedback then undertook the subsequent assessment task. This pattern was repeated over a series of tasks over a period of time.

Consideration was given to using self assessment and peer assessment as a controls. However, both were rejected, self assessment because of student lack of experience in the assessment process (although self assessment was used to some extent in some of the formative interventions). Peer assessment was rejected at this stage for a number of reasons mainly because of the extra pressure that peer assessment potentially places on students. Despite many advocates arguing the benefits of peer assessment in the literature (Boud, 1989; Sambell, Sambell and Sexton, 1999; Sluijsmans et al, 2001; McDonald and Boud, 2003; and Falchiakov, 2005) it was rejected as an instrument in the case studies because of the added complexity in introducing the skills associated with peer assessment and the extra variables that a study involving peer assessment would require.

The design aimed to address many of Campbell and Stanley's (1966) concerns with internal validity and addressing "interaction of testing and X" in external validity and allowing for consideration of "interaction and selection of X" and "reactive arrangements" in Campbell and Stanley's (1966) external validity concerns.

The research design utilised Campbell and Stanley's (1966) pretest-posttest control group design structure, where both groups have a test O1 and only the first group get the intervention before both groups undertake the second test, $O_2$.

R $O_1$ X $O_2$
R $O_1$ $O_2$

In the discussion in chapter 3 a number of issues with the summative assessment were identified. Despite these issues summative achievement was selected as a means of quantifying levels of student achievement, and thus as a measure of the impact of formative feedback on student achievement, The author chose to use summative assessment scores in this study because a) the students participated in the summative assessments, b) creating an extra set of tests would have caused extra work for students and c) the summative marks were subject to external moderation (as part of the external examiner process).

Statistical tools were used in order to consider statistical significance – t-test for independent samples in case study 1 and match-pair t test for the computer forensic students in case study 2. Given the nature of the case studies, effect size was also considered. As will be discussed in chapter 6 the use of the statistical tools did not contribute to the arguments presented in this study.

### *4.5.7 Qualitative Techniques*

In order to gather rich data which could be used in conjunction with the qualitative data there was a need to engage in some form of dialogue with students. A number of potential mechanisms were considered including semi structured interviews, focus groups and discussion groups. As indicated earlier in this chapter an action research methodology supported by use of case studies and discussion groups was adopted.

Semi structured interviews were considered as a mechanism to discuss feedback issues in detail with students, but this instrument was rejected in favour of a series of discussion groups, mainly to make the process of discussion less stressful for participants. A secondary rationale for the discussion groups over semi structured interviews was that it was anticipated that participants in the discussion groups would support and encourage dialogue between the students and also potentially provide prompts for each other's thinking.

The objective in using discussion groups was to obtain rich data on what it is that the students valued in terms of feedback, what the student experience was based on feedback they had received, how students make use feedback in their learning, the issues that students have in relation to feedback and whether the feedback had had a positive impact on their achievement. The questions used to prompt discussion in the groups are provided in Appendix 2 along with the responses from students.

## 4.6 Issues with Design

The first two issues with the design of the research from this study have been discussed earlier in this chapter, and are summarised in this section.

### *4.6.1 Generalisability*

The nature of the action research utilised in this thesis may lead to potential issues concerning the generalisability of the findings from the case studies. However, it was never the intention to extrapolate the findings of this study to a wider population or to make general claims as a result of the study. The intention was to use the findings of the action research and the case studies to inform personal professional practice and to share as an example with others in similar teaching environments.

### *4.6.2 Using Summative Assessment Scores as a Measure*

The problems associated with summative assessment have been discussed in chapter 3. It may seem strange to use summative assessment as a measurement in a study of the impact of formative feedback given the problems associated with summative assessment. The rationale for choosing summative assessment as a quantitative measure is based on students being motivated to engage in summative assessment, summative assessment scores being available, summative scores being a potential measure of student achievement and summative assessment scores being externally checked by external examiners.

### *4.6.3 Agreeing the Definition of Feedback*

There are issues in trying to measure the impact of feedback when there is a range of understandings as to what feedback actually is. It has already been discussed that different students differ in their understanding of the concept feedback (Higgins et al, 2001) and there is suggestion in the literature that there is a difference in the perception of what makes good feedback between students and academics (Maclellan, 2001). Attempts have been made to take into account and discuss the possible ambiguities in the definitions of feedback, particularly in the focus group discussions.

Attempting to isolate the impact of formative feedback is complicated, especially when using summative performance and perception of feedback as measures. There are many other potential variables which could have a positive impact on student summative performance over time, such as developing learning skills, better understanding of the subject through study and practice (irrespective of any feedback provided) and increased motivation as students move along the chronological scale

of the academic calendar. There is also the possibility that students get better at assessments the more assessments they do. Therefore doing a second assignment in a module may see an improvement in the summative marks irrespective of any feedback that is provided on the first assignment or any intervening formative activities.

#### *4.6.4 Nature of Student Cohort*

In the student cohorts being studied in the first year there are also subject and programme differences to take into account which may act as variables in improving summative performance. In particular the computer forensics students had a series of potential advantages which could either individually or taken as a whole had an impact on the students' summative performance. The programme was a new programme, certainly for the first cohort in 2005/06 and was one of only a few such courses available in the UK at the time. Computer forensics had received a large amount of publicity because of widely reported cases in the public domain, and exposure to the subject on popular TV programmes such as CSI, Cold Case and Spooks. This potentially led to a cohort of students who arguably were more highly interested in the subject and more highly motivated.

The computer forensics programme also had a custom designed laboratory which was only available to computer forensics students. The facilities in the laboratory were highly specialised and had a high technical specification. In addition although the laboratory was networked it was not connected to the university network which gave the students a feeling of independence. Specific hardware requirements (such as write blockers – to enable read only imaging) were included in the specification of the laboratory. The laboratory was designed to enable teaching staff to emphasise the principles of evidential integrity and evidential continuity in a practical setting and to give students the opportunity to apply these principles in computer forensics analysis. In effect the laboratory acted as a base room for the computer forensics students – and the computer science students did not have a base room.

Many students studying at university have their own PCs, which are often of a higher specification than can be provided by universities. However, in computer forensics, industry standard software, such as EnCase from Guidance Software, has prohibitively expensive licences and requires a very precise technical specification to run properly. The computer forensics facility in fact addressed research undertaken by Gale (2006:1) who suggests that "in order to keep our young students at university – and these are also the most likely to drop out – we have to provide them with a work environment which is at least comparable and preferably superior to conditions they would have been

working in if they had not come to university". It is unlikely that students would have access to similar facilities as those provided in the computer forensics laboratory, due to the complex technical specification of the laboratory and the prohibitive cost of hardware and software.

The computer forensics students also had an extra-curricular series of practitioner talks providing expert input to programmes through presentations and case studies. The regular input from practitioners, over 20 sessions were arranged in each academic year, gave the computer forensics students the impression that they were being given an extra benefit which, in turn, helped with their levels of enthusiasm and engagement with the programme.

#### *4.6.5 Pedagogic Interest of Academics*

In addition to the potential bias introduced because of the author participating in the research study, there was also a high level of pedagogic interest from academics teaching on the computer forensics programme. There are a series of pedagogical issues in the teaching of computer forensics, focussing on how to teach and assess the subject without overwhelming students with the technical, procedural, and legal aspects of the subject. The fact that students were involved in pedagogic research, including participation in this thesis, may potentially have led to a Hawthorne type effect.

There is also a potential bias introduced by the teaching approach of the individual academics delivering the computer forensics programme. What if it is the case that the tutors who provide developmental and formative feedback are the "good" tutors anyway and they encourage and inspire students to learn from their enthusiasm, their love of the subject matter, their consideration and understanding of pedagogy and students' learning needs? This is a particularly difficult variable to isolate.

The issues discussed above raise some interesting questions about measuring success and the comparability of measures. In order to try and tackle these issues it was decided that the comparisons that would take place in the second year of the student's programme would only include the computer forensics students. This meant that two modules on the computer forensics programme would be analysed. The result of doing this was to negate many of the variables that arose because of the differences in the learning experience between the computer forensics and the computer science students.

## 4.7 Validity and Reliability

In this section the concepts of validity and reliability are considered within the context of the research design for this thesis. It is not the case that validity and reliability have less importance in action research than other methods in educational research, but more a case of validity and reliability being different in action research. Waterman (1998) has suggested that very little consideration has been given to the issues of reliability and validity specific to action research methodology in the educational research literature.

Traditionally in educational research reliability is concerned with the extent to which the research instrument produces the same results on repeated trials or repeated instances. Carmines & Zeller (1979:11) suggest that reliability is the “tendency toward consistency found in repeated measurements in the same phenomenon”. In educational research a reliable method or instrument is one which gives consistent results in different applications.

The "rightness" or "truth value" of research is an issue of "validity." Westmayer (1981:42) summarises the concept of validity in educational research as answering the question, "does this device [or method] measure what it is said [or claims] to measure?" Validity in educational research is commonly discussed in terms of internal and external validity. Internal validity seeks to “demonstrate that the explanation of a particular event, issue or set of data can actually be substantiated by the data” Cohen et al (2000:107). External validity is the “degree to which results can be generalised to the wider population, cases or situations”, Cohen et al (2000:109).

The concepts of validity and reliability are different in the context of action research and in the context of this thesis. The point of this piece of action research isn't to "prove" anything but the aspiration is to use action research to allow the author to take a fresh look at their own work relating to assessment and feedback. Altrichter, Posch and Somekh (1993) argue that judging reliability in action research can only be carried out on a restricted basis as a result of the unique nature of any individual project. In the case of this thesis the validity is provided through the authentic behaviour of the action research. McNiff (1994) claims that validity in action research is not about methodology but is more concerned with the personal and interpersonal issues identified in the research. McNiff suggests that the insights acquired in solving issues of validity help inform action research methodology. This view

is supported by Clark (2000), who argues that action researchers need to present an analysis of decisions made during the conduct of the study to facilitate judgements of validity. Waterman (1998) suggests that by the researcher discussing the issues and influences in their action research it enables the reader to evaluate the level of appropriateness of their influence.

When providing feedback to students it is not the case that there is a set of responses for any particular piece of assessed work. The feedback that is provided is dependent on the student and the student's level of academic development. The feedback provided by the academic is an indication of the educational relationship between the tutor and the student. The feedback is often a judgement made by the academic designed to provoke a response from the student. This thesis seeks to examine whether the feedback provokes a response and whether the student changes their behaviour as a result.

## 4.8 Ethical Considerations

The process of requiring full ethical consent from the Ethics Advisory Committee was considered and discussed. After carefully consideration of the ethical processes and discussion with the author's supervisor the advice was that it was not necessary to put a proposal through the Ethics Advisory Committee. However, ethical principles were applied throughout the research, and in particular the following principles were applied and conveyed to all participants.

### *4.8.1 Informed Consent*

The research and research objectives were discussed with all potential participants. Students were informed about the levels of input that they were being asked to participate in.

### *4.8.2 Risk and vulnerability of the participants*

Consideration was given to students on an individual and a group basis in both the computer forensics and computer science cohorts. The research ideas and the pragmatics of the research were discussed with students and students were assured that their participation, or non-participation, would

not result in any academic or personal risk to them. Every effort was made to reassure students at the beginning of each data gathering exercise. No judgement was made on the students through their participation in this study, and the data gathered were not used for any purpose other than this thesis.

Students had the opportunity to review all written comments that they submitted to the research and withdraw the comments if they so wished. All notes from the focus groups were summarised and shared with the students.

All student participants were over 18 and there were no vulnerable adults on either programme in any of the cohorts.

#### *4.8.3 Confidentiality*

All data gathered in this project was done so in confidence and will only be used in this thesis.

#### *4.8.4 Anonymity*

The names of the institutions which form part of this research study have been changed in the interests of preserving anonymity. Northland, Southland and Eastland have been used to represent the different institutions.

The presentation of any numeric marks (summative and formative) have had student names and identifiers removed. Any names included in feedback examples are aliases. All comments from questionnaires and focus groups have been anonymised. No individuals are named in the thesis and any comments are attributed only at the most generic level (course, year of study). Every attempt has been made to ensure that no individuals can be identified from either comments or the context of the text.

All examples of feedback provided by academic colleagues and used for discussion in the focus groups have been anonymised and all references to students or academic staff were taken out.

#### *4.8.5 Right to Withdraw*

Participants had the right to withdraw from participation at any stage.

## 4.9 Chapter Summary

In this chapter the research question has been discussed in detail and the supplementary research questions that have evolved from the main research question have been identified. The research methodology and the research design have been introduced and the rationale for the methodology and the research design have been critically discussed and justified. The ethical principles applied in the thesis have been presented in section 4.8.

The difficulty in isolating the impact of formative feedback has been discussed and other potential variables affecting student summative performance have been identified and discussed. The way in which the research design is used is discussed in chapter 5 and the results from the research are reviewed in chapter 6.

# Chapter 5 Evolution of the Study

## 5.1 Introduction

The purpose of this chapter is to discuss the data gathering approaches that were adopted and the formative interventions that were used with the computer forensics students. The chapter follows on from the discussion presented in chapter 4 and attempts to describe the various formative interventions and justify the rationale for the design of the formative activities. The purpose of the data gathering exercise was to determine a base line on the perception of feedback from student and academic perspectives.

The discussion on the interventions indicates the formative activities which form the basis of the case studies. It is the impact of these interventions that is measured in order to determine the effectiveness of the formative activities and provide the rationale for change in practice in the provision of formative feedback. The formative activities discussed in this chapter were created in order to try to motivate the students in their learning, encourage empowerment of the students, give students the opportunity to consider the value of the formative activities as part of their learning and education and contribute to improving their summative achievement.

The chapter concludes with a discussion on the discussion groups and provides an indication of the topics to be explored in the discussion groups. The data gathered through the various exercise forms the basis for the discussion and critical analysis presented in chapter 6.

## 5.2 Initial Activity to Determine Perceptions of Feedback

### *5.2.1 Background Context*

The idea for this thesis arose because of comments from external examiners in 2004 suggesting that there was variability in the feedback that was provided to students in the School of Computing, Engineering and Information Studies at Northland University (at the time the author's place of employment). Following the comments from the external examiners a survey was undertaken on the student module review forms (gathered as part of the annual quality assurance process) for the

2004/05 session from 60 computing modules in the School. Although there was not a specific question on feedback on assessment on the module review forms, 58% of the module review forms raised some element of concern about feedback, mainly to do with timeliness (62% of those who raised an issue about feedback) but almost as many complained (54% of those who raised an issue about feedback) about not being able to read the comments that they had received. At around the same time the results of the first National Student Survey were published and the three questions on the feedback on assessment were the lowest scores over the whole survey. These internal indicators provided the impetus to explore the issue of student feedback and led to the development of this thesis.

### *5.2.2 Establishing Perceptions of Feedback*

The purpose of exercise on "Establishing Perceptions of Feedback" was to establish (based on literature review) a framework for categorising levels of formative feedback. The initial studies followed on from the initial data gathered from module review forms, external examiner comments and the 2005 National Student Survey results. The first stage was to ask students to consider what their best and worst experiences of feedback were and then to ask students to envisage what their ideal type of feedback would be. Students were then asked to rank the type of feedback on usefulness in terms of enhancing their learning. Academic staff were also be asked to rank the types of feedback in terms of the perceived usefulness to students and also taking into account workload – the two ranked lists produced by academic staff were compared.

The first stage of the initial study was designed in order to gather data on the student expectations associated with feedback, trying to get an initial impression on what students thought was important. The aspiration was that the data collected would provide information on the type and quality of feedback that students had received in the past (before the interventions in this project started) and give the basis for an initial analysis of the feedback that students were receiving. The data were then used to help in determining the categories in the second stage of the initial study with the aim of determining a framework of feedback types which would be used with students to determine the type of feedback that students value most, the type and style of feedback that would be most useful to them in their learning and the type of feedback they really want as well as an initial indication of any issues or concerns that students have with feedback.

### *5.2.3 Initial Study Stage 1*

In the first stage in the initial study students were asked three basic questions about the quality of feedback and the usefulness of feedback from their academic experience. The questions were distributed via email to all computing students in the School of Computing, Engineering and Information Systems at Northland University in 2004/05, (N= 385 students). Students were asked about the quality of feedback using the following questions;

1 - what was the most useful bit of feedback they received and why ?

2 - what was the least useful bit of feedback they received and why ?

3 if they had the opportunity to specify what type of feedback would be of most value to them what would it be ?

44 students responded to the data gathering email. The analysis of the responses breaks down as follows

*1 – what was the most useful bit of feedback they received and why ?*

The responses were in free format text and the responses were analysed and phrases which occurred on more than one occasion were identified. This process was carried out manually across the 44 responses. It should be noted that a number of students made more than one suggestion

| Key | Categories | Number of responses |
|---|---|---|
| a | Suggestions for future work | 7 |
| b | Easy to understand comments | 3 |
| c | Suggestions for additional marks | 4 |
| d | Sample solution | 2 |
| e | Pointed out mistakes | 3 |
| f | Work with comments | 3 |
| g | Written comments | 2 |
| h | Identifying where marks have been lost | 2 |
| i | Grade | 3 |

*Figure 5.1 Summary of Initial Student Perception of Useful Feedback*

The most common comment in response to this question was feedback where students had been given suggestions for future work. This mis-spelt comment summarises the common desire for feedback which can be used to help with future learning.

*“the most usefull feedback is where tutors specifi exactly what you could of done to improove the work therefore allowing you to learn from any mistakes you may have made. This is best demonstrated in*

*modules where there was live assesements and the tutor went through the work with you and gave instant feedback explaining what you could have done different",* (2nd year student).

However, if the categories, c, e, g, and h are combined into a super-category of written comments then this becomes the most common category based on the desire for feedback on the current state or stage of the students learning and understanding. It was a surprise that students were in effect saying that any written comments is the most useful type of feedback.

*2 – what was the least useful bit of feedback they received and why ?*

The second question was aimed at identifying weaknesses in the feedback that they were given, but many of the responses were indicated the frustrations that students have in the provision of feedback. The process for analysing the response discussed in the analysis of question 1 was repeated.

| Key | Categories | Number of responses |
|---|---|---|
| a | No feedback | 12 |
| b | Insulting comments | 3 |
| c | Marks only / grade | 6 |
| d | Pointed out mistakes / what I hadn't done correctly | 5 |
| e | Didn't get to keep assignments | 4 |
| f | Quality of feedback - author's classification combining student comments | 3 |
| g | Feedback in front of class | 2 |

*Figure 5.2 Summary of Initial Student Perception of Least Useful Feedback*

There were fewer categories in the response to this question. The most common complaint in response to this question was that when "no feedback" was provided on summative coursework. Over 27% or respondents (12 out of 44) had the "no feedback" as their main complaint. Some students provided very strong comments on how much this annoyed and upset them, for example, *"No feedback received on any assignments, the amount of feedback is bad"* (2nd year student on computer science), and "*Not received feedback from my assignments even though we asked again and again"* (2nd year student on internet computing).

Even in the instances when students received feedback, they were not always happy with the quality of the feedback. The following comment indicates the strength of feeling from students, but also illustrates the type of comment that have been included in the category "quality of feedback", *"unsure as most of my feedback has been unspecific, vague and impersonal"* (final year student on internet computing).

Quality of comments – this came in a variety of forms of complaint, including, vagueness, difficulty in understanding comments, insulting, demotivating (one student commented that they were so demotivated by the feedback that they received that "*after the feedback they received they would not go back to the class"*), (2nd year student on computing)

A number of students raised the issue of only receiving a grade for their work – this was put forward as both a complaint (in response to question 2) and as an indication of good feedback (in response to questions 1 and 3). The difference of opinion amongst students reflects the differences in findings on the "what students want in terms of grades only" debate in the literature. *"Most modules (if not all) simply give you your grade back after completing an assignment. I think it would be a lot more helpful if we got our full assignments back to see exactly where our strong and weak points were within the assignment to help us improve these areas in future modules/assignments",* (final year student on computer science).

Some students were also concerned that they didn't get to keep their assignment after the grade and feedback had been given – which possibly adds to the discussion in chapter 3 about who the feedback is really for. Is it for students or is it for external examiners to show that feedback is being provided? Students felt that if they didn't have the opportunity to return to the feedback later in their studies then they were disadvantaged.*"Nothing we've had has told me something I didn't already know. Plus we're not allowed to keep our feedback. That makes it hard for us to be able to learn from it as we can't learn from feedback we haven't got on us",* (1st year student on computer science).

As well as the issue about not being able to keep feedback one student raised a question about the usefulness of the feedback in enhancing their learning – *"Nothing we've had has told me something I didn't already know"* – is a particularly damming reflection on the quality of the feedback which that particular student had experienced.

Students also do not like to be told about a particular feedback strategy and then for that strategy not to materialise in practice as the comment below indicates. Although the following comment potentially opens a range of further issues on student expectation, the comment was included in the "quality of feedback" category. *"At the beginning of this module, we were informed that every week when we handed in an activity, the seminar tutor would read through and write comments on the activity. No comments were ever written, just verbal, so by the time the tutor handed back the work, you forgot*

*what improvements and feedback he suggested in early parts of the task",* (2nd year student on computer science).

*3 - if they had the opportunity to specify what type of feedback would be of most value to them what would it be ?*

The third question was potentially an overlap with the first question – but the idea was to give students more freedom to specify their ideal type of feedback rather than base their comments on their feedback experiences. Again a manual analysis of the responses was undertaken.

| Key | Categories | Number of responses |
|---|---|---|
| a | Mix of written and verbal feedback | 4 |
| b | Talk through with tutor face to face | 3 |
| c | Comments on mistakes | 3 |
| d | Personalised feedback | 2 |
| e | Examples / sheet of hints to improve / checklists / model answers | 5 |
| f | Positive criticism | 2 |
| g | Annotated scripts | 2 |

*Figure 5.3 Summary of Initial Student Perception on Ideal Feedback*

There were fewer responses to this question, many students choosing to leave the space blank. Many of the suggestions duplicated the responses to question 1. A number of respondents who had received no feedback during their studies were very conservative in their expectations, simply asking for comments on mistakes.

One change from students in comparison with the responses to question 1 was an indication of the desire for verbal feedback. This has not been included in the categories in the second stage of the study, because the intention in the second stage was to look at the type of feedback irrespective of whether the feedback was written or verbal. Although verbal comments also raised concerns with some students, for example, *"No comments were ever written, just verbal, so by the time the tutor handed back the work, you forgot what improvements and feedback he suggested in early parts of the task"* (final year computing studies student). Verbal feedback is returned to later in the thesis.

It was interesting that students did not suggest that in an ideal world they would get feedback from their peers, which contradicts suggestions in the literature from Boud (1989), Sluijsmans et al (2001), Flachikov (2005).

The responses to the three questions in the first stage of the study were used in the design of the "categories of feedback" for the second stage of the study.

### *5.2.4 Initial Study Stage 2*

The purpose of the second stage of the study was to try and get a ranking of what students and academic staff thought were the most appropriate and useful forms of feedback. The literature was used to identify potential classifications of feedback. The categories were derived from the outcomes of the first stage of the study and from the literature (Hounsell, 1987; Ding, 1998; Adams et al 2000; Haines, 2004).

Using the responses from the first stage of the study and taking into account the issues raised in the literature on assessment and feedback, 4 classifications of feedback type were constructed.

1 – no feedback at all

2 – mark or grade only with no explanation

3 – information to student indicating correct response

4 – feedback appropriate to student response

The initial listing was tested with a group of students (N =10). The students were asked if the classifications were understandable. It became apparent that it was not clear what was meant by classification 3 "information to student indicating correct response" and that classification 4 "feedback appropriate to student response" had a range of potential interpretations, including whether the feedback was "written or oral" and when comments were provided there was a difference in the type or style of comments. The different type of comments included the following: generic comments; comments on correcting grammar, structure etc – very little subject specific; comments on what student did not do correctly; comments on how to improve (feedforward).

As a result of testing the previous group of categories the following list of categories was created with reworded and additional categories in order to remove potential misunderstanding in interpretation by respondents. The attempt to create distinct classifications also took into account the issues raised in the literature (Black and Wiliam 1999; Maclellan, 2001; Hall and Burke, 2003; Yorke, 2003; Nicol and Macfarlane, 2004; and Hounsell, McCune, Hounsell and Litjens 2008).

All the computing students in the School were given the opportunity to participate. 31 students from a total population (N) of 385 participated. They were asked to rank the following categories 1 – 8 in order of importance to them. Students were also given the opportunity to add free text comments during this exercise. The eight categories were:

a) no feedback

b) mark only

c) model solution

d) comments on what you did incorrectly – generic, report structure, grammar, spelling, referencing etc

e) comments on what you did incorrectly – subject specific

f) comments on what you did incorrectly – question specific

g) annotated comments on script

h) comments on what to do differently next time in order to improve

| | | Average Score |
|---|---|---|
| D | comments on what students did incorrectly – generic, report structure, grammar, spelling, referencing etc | 2.90 |
| H | comments on what to do differently next time in order for student to improve | 2.94 |
| F | comments on what students did incorrectly – question specific | 2.97 |
| E | comments on what students did incorrectly – subject specific | 3.39 |
| G | annotated comments on script | 3.39 |

| | | |
|---|---|---|
| C | model solution | 4.55 |
| B | mark only | 6.42 |
| A | no feedback | 7.90 |

*Figure 5.4 Sorted Ranking of Feedback Categories*

The ranking of classifications from students was largely as had been expected / anticipated based on recommendations from literature, with the categories of "no feedback" and "grade only" being the lowest ranked. However the top ranked "comments on what students did incorrectly – generic, report structure, grammar, spelling, referencing etc" was not expected to be the top category. The literature review indicated that feedback which was generic in nature was not particularly helpful feedback to students in terms of enhancing their learning. For example Nicol and Macfarlane-Dick (2004:11) suggest that a great deal of "feedback information is often about strengths and weaknesses of handed-in work or about aspects of performance that are easy to identify (such as spelling mistakes) rather than about aspects that are of greater importance to academic learning but that are more abstract and difficult to define (such as strength of argument)". However, from this small sample it appeared that students valued this type of feedback, for example *"I like when I get feedback that tells me how to improve my report writing and referencing – these are things I will use again because all my reports need these"* (computing studies student, year 2).

It was interesting that students recognised the potential value of the feedback category, "comments on what to do differently next time in order for student to improve". A more detailed discussion on the ways that students use feedback is returned to in chapter 6. It was surprising that "annotations on scripts" was ranked so poorly. Further examination of the student questionnaires which had included comments on annotation of scripts indicated that the issue of annotation appeared to be associated with *"not being able to read the comments"* (internet computing year 1 student), but also that the *"the written comment on the script did not make any sense and wasn't helpful"* (computing student year 2).

A follow on to the initial study was created in order to try to ascertain the relative importance students placed on quality and timeliness of feedback. Whilst students had raised the issue of no feedback at all in the first stage of the initial study, there was very little concern relayed in terms of the speed of the return of the work.

The following subset was created taking into account the complexity of categorising feedback, the range of potential variables and issues identified in the literature (timeliness,). The classifications in

the exercise above did not include anything to do with fairness or work. The idea behind the next exercise was to get a feel as to whether students would rather have poor quality feedback quickly (timeliness and speed of turnaround were issues identified by both or Race (2005) and (Cowan 2003)) or to have better quality feedback but with a slower turn round. Students would prefer to have high quality feedback quickly, but analysis of the small sample below suggests that they are less concerned about the speed of feedback than the literature suggests – based primarily on written comments on summative assessment. This appears to be different to the information obtained from the National Student Survey where in 2006, 49%, 2007, 47% and 2008, 44% students said that feedback was slow and unhelpful. In the NSS example it is unclear whether the student concern with feedback is because the feedback was slow getting to them or it was unhelpful when the received it, or perhaps a combination of both slowness and lack of helpfulness.

The students were asked to rank the following in order of importance to them

a) clear comments on performance
b) clear comments on how to improve
c) speedy return of work
d) fair and accurate marking

| | | |
|---|---|---|
| B | Clear comments on how to improve | 1.61 |
| D | Fair and accurate marking | 1.90 |
| A | Clear comments on performance | 2.65 |
| C | Speedy return of work | 3.29 |

*Figure 5.5 Sorted Ranked Additional Breakdown of Feedback Categories*

The ranked order for this set of classifications (again with a small sample of students) indicates that with this group of students they place greater value on the clarity of comments showing how they might improve in the future. It was interesting that students ranked fair and accurate marking more highly than clear comments on performance. The relative position of the two clear comments categories suggests that for this group of students they place greater value on comments on how to improve than comments on performance. The nature of the type of comments that students want from feedback is discussed with students in discussion group sessions.

It was interesting to note that the speedy return of work was the least important category for students in this particular exercise. The reasons that the students give for speed being less important to them than comments and fairness will be explored in the discussion groups.

The next step in this part of the study was to attempt to ascertain academic staff perception on the value of the different types of feedback. The exercise was undertaken with academic colleagues in computing schools / departments, University of Northland (16 participants, total population = 64) and University of Eastland (9 participants, total population = 57). In addition to the data requested from students academic staff were asked to score what they thought was best for students in terms of feedback and then what they did in actual practice. Staff were given the opportunity to comment on why there might be a difference in the two scores. Staff were also asked to indicate any other categories that they though appropriate.

| | Category | Best for Students (BFS) Average Score | Actual Practice (AP) Average Score | Difference |
|---|---|---|---|---|
| A | no feedback | 8.57 | 8.64 | -0.07 |
| B | mark only | 7.43 | 7.57 | -0.14 |
| C | model solution | 5.00 | 5.36 | -0.36 |
| D | comments on what students did incorrectly – generic, report structure, grammar, spelling, referencing etc | 4.57 | 5.14 | -0.57 |
| E | comments on what students did incorrectly – subject specific | 3.64 | 3.43 | 0.21 |
| F | comments on what students did incorrectly – question specific | 2.64 | 2.79 | -0.15 |
| G | annotated comments on script | 3.07 | 2.79 | 0.28 |
| H | comments on what to do differently next time in order for student to improve | 2.29 | 2.36 | -0.07 |
| I | Other | | | |

*Figure 5.6 University of Northland Academic Staff Ranking Feedback Types*

The information from staff was sorted on the “what is best for students” rank and this was compared with the “actual practice” rank. The categories were ranked in the same order.

| | Category | Best for Students Average Score | Student ranked position | Staff N'land ranked position BFS | Staff N'land ranked position AP |
|---|---|---|---|---|---|
| H | comments on what to do differently next time in order for student to improve | 2.29 | 2 | 1 | 1 |
| F | comments on what students did incorrectly – question specific | 2.64 | 3 | 2 | 2 |
| G | annotated comments on script | 3.07 | 5 | 3 | 3 |
| E | comments on what students did incorrectly – subject specific | 3.64 | 4 | 4 | 4 |
| D | comments on what students did incorrectly – generic, report structure, grammar, spelling, referencing etc | 4.57 | 1 | 5 | 5 |
| C | model solution | 5.00 | 6 | 6 | 6 |
| B | mark only | 7.43 | 7 | 7 | 7 |
| A | no feedback | 8.57 | 8 | 8 | 8 |

*Figure 5.7 University of Northland Academic Staff Ranking Feedback Types Sorted on Best for Students*

A comparison of the rankings between students and academic staff indicate a mainly similar pattern. However, the major difference is in the position of the classification "comments on what students did incorrectly – generic, report structure, grammar, spelling, referencing etc". Academic staff appear to agree with the suggestions from the literature that this was not particularly helpful category for students, but disagreeing with the ranking importance given to this category by the students. The value that students placed on generic comments as opposed to subject specific comments or comments on correctness and opportunities for improvement will be explored in the discussions with student groups. The exercise was repeated with colleagues from the Computer Science Department at the University of Eastland.

| | Category | Best for Students (BFS) Average Score | Actual Practice (AP) Average Score | Difference |
|---|---|---|---|---|
| A | no feedback | 8.00 | 7.86 | 0.14 |
| B | mark only | 6.86 | 7.00 | -0.14 |
| C | model solution | 4.14 | 4.00 | 0.14 |

| | | | | |
|---|---|---|---|---|
| D | comments on what students did incorrectly – generic, report structure, grammar, spelling, referencing etc | 4.29 | 4.43 | -0.14 |
| E | comments on what students did incorrectly – subject specific | 3.86 | 3.86 | 0.00 |
| F | comments on what students did incorrectly – question specific | 1.29 | 1.57 | -0.29 |
| G | annotated comments on script | 2.00 | 2.14 | -0.14 |
| H | comments on what to do differently next time in order for student to improve | 3.00 | 3.29 | -0.29 |
| I | Other | | | |

*Figure 5.8 Eastland University Academic Staff Ranking Feedback Types*

Figure 5.9 shows the similarities and differences in staff perception from the two computer science departments from Eastland and Northland. The rankings were very similar with the bottom five categories being the same between the two groups. The difference was in the order of the top three ranked categories – colleagues from Eastland favouring the provision of feedback which indicated "comments on what students had done incorrectly at subject specific level", whereas the colleagues from Northland ranked the category "comments on what to do differently next time in order for student to improve" .

| | Category | Best for Students Average Score | Staff E'land ranked position BFS | Staff E'land ranked positio n AP | Staff N'land ranked position BFS | Staff N'land ranked position AP |
|---|---|---|---|---|---|---|
| F | comments on what students did incorrectly – question specific | 1.29 | 1 | 1 | 2 | 2 |
| G | annotated comments on script | 2.00 | 2 | 2 | 3 | 3 |
| H | comments on what to do differently next time in order for student to improve | 3.00 | 3 | 3 | 1 | 1 |
| E | comments on what students did incorrectly – subject specific | 3.86 | 4 | 4 | 4 | 4 |
| D | comments on what students did incorrectly – generic, report structure, grammar, spelling, referencing etc | 4.14 | 5 | 5 | 5 | 5 |
| C | model solution | 4.29 | 6 | 6 | 6 | 6 |
| B | mark only | 6.86 | 7 | 7 | 7 | 7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| A | no feedback | 8.00 | 8 | 8 | 8 | 8 |

*Figure 5.9 Eastland University and University of Northland Academic Staff Sorted Ranking Feedback Types, by UU Best for Students*

## 5.3 Case Study 1 – Year 1 Formative Interventions

This section provides details of the formative activities which formed the basis of the case studies. The descriptions provided indicate the rationale for including the type of intervention and where appropriate, data are provided to illustrate the effect of the intervention. Discussion groups were held with students after each of the major interventions described.

### *5.3.1 Introducing Formative Feedback*

During induction week for the first year computer forensics students (in each of the three cohorts) there was a discussion on pedagogic research in computer forensics and that the research that formed the data gathering in this thesis was taking place. Students were introduced to the principles of formative assessment and formative feedback by way of a computer forensics exercise on "phishing" – "phishing" is a method used by fraudsters to acquire personal data which can then be used to gain entry to a victim's online financial accounts.

At the end of the exercise the students were given verbal feedback. The feedback given at this point was the students' first experience of verbal feedback. The students were told that they had just been "phished" and that they had given enough information to allow their identities to be stolen. The students were also told that they should be prepared to ask questions about what tasks they were doing and that they should not take people at face value. As well as skills against phishing these are also key skills for computer forensics practitioners.

### *5.3.2 First Major Intervention*

The major formative intervention for first year students was built into the first piece of summative assessment. As indicated in chapter 2 students taking the computer forensics programme and those students taking computer science had a very similar programme of study in their first year. The difference is that computer forensics students took the module, “Principles of Computer Forensics” rather than the module “Introduction to Systems Analysis”. In both modules there is an assessment strategy of one piece of coursework halfway through the module and one piece of assessment towards the end of the module. Both modules are year-long modules. The computer forensics module has been designed to incorporate a series of formative feedback and formative assessment interventions, whereas the systems analysis module has no formative feedback.

From the very beginning of the module the computer forensic students are introduced to the concept of formative feedback – written and oral. As indicated in the discussion on the “phishing” exercise the computer forensics students are particularly encouraged to reflect on the formative feedback and consider how they can utilise the feedback in future activities. Nicol and Mcfarlane-Dick (2004:10) suggest that in “HE, most students have little opportunity to use directly the feedback they receive to close the gap, especially in the case of planned assignments”. Nicol and Mcfarlane-Dick go on to suggest that the reason for not making use of feedback is that students “move on to the next assessment after feedback is received”. The links between the various tasks and assessments that take place on the computer forensics module were discussed with students, and as part of the second assessment on the first year computer forensics module students were specifically asked to consider and explain how they used the feedback from assessment 1 in the process of undertaking assessment 2.

The first year computer forensics module consists of two summative pieces of assessment. The first is handed in 12 weeks into the module and the second handed in after 22 weeks. This is a similar assessment pattern to the module that students on the computer science programme take, the main difference (apart from the subject matter) is that the computer science students do not receive written feedback on their first summative assessment.

Data on the first summative assignment for the first year computer forensics module was gathered with 3 different cohorts of students, 2005/06, 2006/07 and 2007/08. The assessment specification

was modified slightly each year, but the learning objectives, the general design of the assessment and the assessment expectations on the students were constant.

The first summative assessment of two in the module had a hand-in date of week 13 out of a 26-week module. Formative feedback in this part of the study was given to students in week 14. Annotated feedback was provided throughout the student's written work and a summary of subject specific feedback provided on a front sheet. The intention in giving the feedback in this exercise was to contextualise the feedback based on the student work and indicate where students had done well, where there might be issues, where they could "close the gap" in their subject understanding and what developmental activities to feedforward to future assessments or modules.

There is a suggestion in the literature – for example Adams et al (2000) – that students only want numeric marks as a form of recognition. In designing the feedback exercise the students were provided with summative scores before they got their written feedback at the end of week 14. This was done via the University's virtual learning environment (VLE). The indicative numerical mark given on Monday of week 14 via virtual learning environment (VLE) – not quite ignoring the literature (Black, 1999) for example suggesting that feedback is better without numeric marks – but it was decided to get the marks out of the way using the VLE so that students could consider their marks and then put the marks to one side and concentrate on engaging with the written feedback comments.

An extra student seminar was arranged for week 14 (one week after submission). This was repeated for each of the separate cohort year groups. The intention in this exercise was to get students to think about how they had approached the assessment and then to encourage them to engage with feedback on the assessment. The exercise was designed based on Rust's (2002:145) assertion that "just giving feedback to students without requiring them to actively engage with it likely to have only limited effect [on student learning and understanding]". The aspiration in encouraging students to engage with the feedback was to "make them do things", to use Ramsden's (1992) phrase, in order to encourage learning from the feedback.

The feedback seminar was split into three stages / tasks:

i) the first task was to encourage students to reflect on the assessment by considering the way in which they had tackled the assessment (before students had received feedback),

ii) the second was to ask them how they felt about their numeric mark (numeric mark only with no written feedback) and

iii) the third stage encouraged the students to engage with the feedback (after they had received their feedback). The third task specifically asked students whether the feedback was helpful to them and if it was then how it was helpful to them.

Figure 5.10 was constructed by manually fitting the student responses into categories and then scoring the number of responses. Where the number of responses do not add up to the total the students had left the question blank. The row beneath the raw scores indicates percentage. For example a student comment such as *"I was confused whether the assignment should be more descriptive or analytical and now I know it should be a bit of both"* (computer forensics students from 2006/07 cohort) would count 1 in the "understanding benchmark standards" category. *"Telling me the steps in evidential integrity made me understand what it was about"* (computer forensics student from 2007/08 cohort) would fit into "understand subject better". An example that would fit in the "provided encouragement" category is *"I was pleased and surprised with my mark and the written comments made me pleased"*, (computer forensics student 2007/08 cohort).

| Cohort | No of Partics | Helpful | | Understand benchmark for standards | | Understand subject better | | Provided Encourage | | Whether they would do things differently in next assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Yes | No | Yes | No | Yes | No | Yes | No | Yes | ? | No |
| 2005/06 | 18 | 12 | 4 | 11 | 2 | 11 | 5 | 9 | 6 | 10 | 3 | 5 |
| | | *66.7* | *22.2* | *61.1* | *11.1* | *61.1* | *27.8* | *50.0* | *33.3* | *55.6* | *16.7* | *27.8* |
| 2006/07 | 29 | 21 | 6 | 17 | 3 | 15 | 4 | 17 | 1 | 19 | 7 | 4 |
| | | *72.4* | *20.7* | *58.6* | *10.3* | *51.7* | *13.8* | *58.6* | *3.4* | *65.5* | *24.1* | *13.8* |
| 2007/08 | 35 | 25 | 5 | 20 | 2 | 18 | 7 | 23 | 6 | 21 | 10 | 4 |
| | | *71.4* | *14.3* | *57.1* | *5.7* | *51.4* | *20.0* | *65.7* | *17.1* | *60.0* | *28.6* | *11.4* |

*Figure 5.10 Student Perception after feedback on summative assessment 1 on computer forensics programme*

The details on the student responses were used as input to the discussion group following on from this activity. Analysis of the above table indicates that the majority of students found the feedback helpful, slightly more in the second and third year groups (equivalent total in first, although these were not the same 11 students responding positively in both subject understanding and academic

standards) found the feedback helped them more to appreciate what was required from them in terms of academic standard rather than in helping them learn about their subject. The majority found that the feedback provided encouragement. The majority in each year claimed they would do things differently in future assessments but a large minority indicated they weren't sure or that the feedback didn't encourage them to do things differently.

### *5.3.3 Follow Up on Major Formative Intervention*

In week 16 (before the second assessment specification was distributed) a discussion group was held (discussed in section 6.3.2). The main objective in this group was to encourage students to talk about how useful the feedback on the first assignment had been, how they might use the feedback in the future and what they might do differently as a result of the feedback both for the next assessment in the computer forensics module and for other assessments that they had to do on other modules on their course.

- Did the feedback help you judge you level of understanding ?
- How did the feedback you received on your assessment help you ?
- Did the written feedback comments help you understand why you got the mark you did ?
- Will you use the feedback comments in future assessment tasks ?

Responses to the questions are provided in Appendix 2 and an analysis of the responses is provided in chapter 6.

One of the aspirations in providing the detailed intervention as part of the first assessment was that the students would use the feedback from assessment 1 as input to assessment 2 and that their summative scores would improve between assessment 1 and assessment 2. As a result the first part of the second assessment requested that they consider the feedback (and they got summative marks for doing this).

### *5.3.4 Second Computer Forensics Assessment in Year 1*

In the second summative assessment for the computer forensics module students were asked to produce a report on computer forensics issues in relation to the criminal justice systems in England and Wales and to critically discuss the ethical issues associated with activities in the computer

forensics domain. The first part of the assignment specifically asked students to reflect on their learning based on feedback from their first summative assessment in the module and from other formative interventions activities that had been included in the module.

On completion of the assignment, the assignment was marked and the marks provided to students via the VLE. Students were invited to attend a session in order to pick up their feedback. This session was very poorly attended in the first year of this project with only 2 students attending. The second year was only slightly better with 4 students coming to the session to discuss their feedback. For both cohorts the feedback session was repeated in induction week as the students started their second year of study. For the third year the session was not organised immediately after the assignment and was deferred until the induction week period.

For the students who turned up to the sessions on feedback, instead of repeating the exercise from the first assessment, the opportunity was taken, after discussion with the students and obtaining their permission, to have discussions about feedback on the module and feedback in general. This was a convenience sample (the students were there) but self selecting, ie the students had chosen to attend for feedback. The sample was a skewed sample because the 6 students over the two years were students who had performed very well and were at the top performing end of the cohort. These students had actively participated in all the formative activities and all expressed interest in the feedback process as well as being interested in enhancing their learning from the feedback they received.

It was hoped in this situation to make use of Campbell and Stanley's (1966) pretest-posttest control group design, where $R_1$ is the computer forensics group, $R_2$ the computer science group. $O_1$ is the first assignment mark and $O_2$ is the second assignment mark. X is the feedback intervention for the computer forensics students. $O_1$ and $O_2$ were different assignments in each case, but were at the same academic level – which means that there is a deviation from the pure pretest-posttest scenario.

$R_1 \quad O_1 \quad X \quad O_2$

$R_2 \quad O_1 \qquad O_2$

A more accurate representation is as follows because the assessments that the 2 groups did were not the same, although they were of similar academic level. The subscript indicates that the $R_1$ group did the computer forensics assessments whereas the $R_2$ group did the computer science assessment.

$R_1 \quad O_{1CF} \quad X \quad O_{2CF}$

$R_2$ $O_{1CS}$ $O_{2CS}$

The alternative approach considered was to split the computer forensics cohort into two groups, one which would be provided with detailed feedback and participate in the reflection on feedback exercise and one group which would not. Whilst this may have allowed for a more accurate comparison between more closely aligned groups and avoided some of the issues of other variables having an impact on the computer forensics and computer science cohorts. It was felt that it would be unfair on the computer forensics cohort to have different feedback strategies. However, as discussed in chapter 3 and illustrated in the analysis of second year modules, the comparison was made within the computer forensics student cohorts and the comparison was between the two second year computer forensics modules, one which had formative activities and formative feedback and one which did not.

## 5.4 Case Study 2 - Year 2 Interventions

The students who participate in the second case study (year 2 interventions) participating in this study are the 2006/07 and 2007/08 cohorts. With the exception of 3 students in the 2007/08 cohort who were direct entrants into the second year, all the students had taken the first year computer forensics module.

The structure of the computer forensics programme in the second year differs from the computer science programme in over 70 credit points. Therefore it was decided to compare the computer forensics cohort by comparing two modules on the computer forensics programme, one which had a number of formative activities and formative feedback and one where there was very little formative feedback provided. The two modules being compared were the “Theory of Computer Forensics” (CM0541) where formative feedback was included and “Computer Forensics Applications” (CM0542) where there was very little formative feedback. The rationale for this was to try to examine the impact of formative activities on the same group of students thus attempting to minimise the number of variables which could have an impact on the summative performance.

### *5.4.1 Induction week activities*

During induction week for the students returning to the second year a number of activities were arranged. On their first day back they were provided with the feedback from their second assessment from their first year. Although the timeliness of this feedback differed from their previous feedback on their computer forensics module – the intention was to provide students with feedback that would help them as they moved into their second year studies. Whilst there was feedback on what students had done well and indications on any places where they didn't have a complete understanding. The majority of feedback discussions focussed on the differences in academic expectation between first year and second year. Particular emphasis was placed on critical analysis, substantiation of points and using literature and empirical evidence to build their academic arguments. Students were also told about the expectation that the amount of work that they would be required to do would increase.

The feedback on the second first year assignment was distributed to students. The consideration of feedback in this instance with both cohorts was different to the engagement with the feedback from their engagement with the year 1 first assessment. The students were not particularly interested in the written feedback and mainly wanted to confirm that the grade mark on the assessment (added to the first assessment mark) tallied with the module mark that they had been given on their student transcripts from the exam board at the end of the previous academic year.

In the induction week period for second year students, they were given a group task to give a presentation on a computer forensics topic. The task was set on the Monday (first day back) and the students had to deliver their presentation on the Friday of induction week. The rationale for the task had a number of strands, a) to get the students back in to the way of academic work after the summer, b) to introduce the increased expectation on independent working in year 2, and c) to introduce the expectation of undertaking research activities as part of their course. Finally there was an opportunity to provide students with feedback on the presentations in both written and verbal formats. Tutor feedback was provided both verbally and orally. There was also the opportunity for peer feedback to be provided to students.

### *5.4.2 Mock Exam Formative Exercise*

The assessment strategy for the module CM0541 is an examination in week 14 (effectively the second week after the Christmas vacation) and a conference paper on a forensics topic and presentation at the end of the module. When the 2006/07 cohort was given the module guide, they raised concerns about doing an examination in the subject. The students had no examinations in their

first year, only a small class test in two of their modules as part of the assessment for those modules. The students were worried about the type of questions they might have to tackle and what they would be expected to produce in exam. It was negotiated with the students that a mock exam question would be produced and the students would tackle this in week 8 during their seminar class time. Students did one question in 45 minutes (slightly longer than the time they would have in the exam where they would have 40 minutes per question, they would have three questions in 2 hours) under closed book (as opposed to open book) examination conditions. The exam questions were marked and an extra feedback sheet provided – so the students had annotated scripts with more detailed comments than would normally be produced on an exam paper and an individualised front sheet. As part of the feedback discussion exam papers were swapped between students and peer feedback provided.

A discussion group in both years was held after the mock exam feedback had been provided and before the actual exam took place. The questions used to prompt discussion are included below. Responses to the questions/ extracts from the discussions are provided in Appendix 2. The questions were:

- Was the mock exam a useful exercise ?
- Did the mock exam help you realise what was expected in the actual exam ?
- Did the feedback on the mock exam change the way you tackled the actual exam ?
- Was it useful to get peer feedback ?

### *5.4.3 Conference Paper Exercise*

The final major formative activity for the second year computer forensics students on module CM0541 was based around a proposal for a conference paper. Students were asked to prepare a 500 word abstract submission for a conference on “Issues in Computer Forensics”.

The “conference” had a series of themes including, technical developments, computer forensics applications, challenges in computer forensics, professional issues in computer forensics and teaching computer forensics. Students were given feedback in the style of conference submission categories with a rating for each category and a numeric score (1 – 5, 1 being poor through to 5 being excellent). The categories that students were provided feedback on included:

- Relevance to conference theme
- Currency of topic
- Originality

- Audience interest
- Level of changes required for acceptance

A category of accept / reject was not included, because it was felt that a “reject” response whilst potentially realistic might be demotivating for students.

## 5.5 Computer Forensics Module in Year 2 for Comparison

As has been indicated the attempt to measure the impact of formative feedback on summative assessment compares the two separate computer forensics modules. Both modules were taken in parallel by the same set of students. The module to be compared with CM0541 (the module that had formative feedback embedded) was the module “Computer Forensics Applications”, CM0542. This module had the same credit size as the CM0541 module (both 20 points) but had a different assessment strategy. In CM0542 students were expected to develop a lab book over the academic year based on a series of laboratory based exercises. There were 15 exercises over 2 semesters and students handed in their lab book at the end of the second semester. Students were given technical support throughout the module but they were not given any written formative feedback during the module.

## 5.6 Discussion Groups

The objective in using discussion groups was to obtain rich data on what it was that the students valued in terms of feedback, how students made use feedback in their learning, the issues that students had in relation to feedback and how believed their achievement levels changed as a result of feedback.

### *5.6.1 Student Discussion Groups*

The aim of the data gathering in the discussion groups was to ascertain a list of things that the students valued from formative feedback, and what they perceived as important in formative feedback with particular emphasis on how formative feedback enhanced their learning.

Student discussion groups took place at three points during the data gathering phase, after the first summative assignment in the first year of study after the mock examination formative exercise in the

second year and towards the end of the second year. Students from both the computer forensics and the computer science cohorts were given the opportunity to participate in each of the discussion groups. However, no computer science students took part in the first discussion group in any of the three years, the main reason for non participation was that they had not had any feedback. Similarly no computer science students took part in the second discussion group in either of the two years. Only 2 computer science students took part in the final discussion group in 2006/07 and 1 in 2007/08. The number of computer forensics students participating in each of the discussion groups is indicated below.

| Cohort | Discussion Group 1 | Discussion Group 2 | Discussion Group 3 |
|---|---|---|---|
| 2005/06 | 6 | | |
| 2006/07 | 8 | 12 | 8 |
| 2007/08 | 9 | 16 | 7 |

*Figure 5.11 Number of Computer Forensics Participants in Discussion Groups*

The first discussion group encouraged students to think about the assessments that they had taken up to that point in their first year. The discussion group took place in week 3 (week 15 in the module) or 4 (week 16 of the module) of the second semester, (week 3 in 2006, week 4 in 2007 and week 4 in 2008). The main objective in this discussion group was to encourage students to talk about how useful the feedback on the first assignment had been, how they might use the feedback in the future and what they might do differently as a result of the feedback both for the next assessment in the computer forensics module and for other assessments that they had to do on other modules on their course.

At the second discussion group students were asked to consider the type of feedback they found useful and the ways in which they used feedback, particularly with reference to the mock exam intervention in the first semester of their second year.

At the third student discussion groups students were shown examples of types of feedback and these were used as the basis for the discussions although the students were free to talk about any aspects of their assessment. The key objective in this discussion group was get students to discuss what it was that they understood from the feedback they had experienced during their first two years but also to consider the examples. The same examples were later used in the staff discussion groups. The

feedback examples used in the discussion group are available in Appendix 3. In addition to the examples included below one blank page with a number was in the feedback material discussed with the students.

## 5.7 Chapter Summary

In this chapter the initial studies that were used in the research design have been presented. The stages in the initial studies provide the basis for the classifications of feedback types which are used in the formative interventions and will be used in the analysis in chapter 6. The initial studies also provided an initial indication of the issues associated with the provision of feedback.

The various formative interventions are described and the points at which data have been gathered are indicated. The ways in which discussion groups have been used in the research are introduced and the objectives of the discussion groups presented. In chapter 6 the data and the data analysis of the data will be discussed and the findings from the research presented.

# Chapter 6 Analysis of Data

## 6.1 Introduction

In this chapter an analysis of the quantitative and qualitative data gathered from the action research and case studies is presented. The objective of the analysis was to determine whether the interventions, introduced in chapter 5, had an impact on the student learning experience and student achievement. The analysis compared groups of students who had been given formative feedback with groups of students who had not. The analysis of the quantitative data compared the relative summative performance of the various groups of students, normally comparing one group who had received a formative intervention with a group who hadn't. This was repeated over 3 years for the first year students and in 2 adjacent years for the second year students. The main numeric measurement for student achievement was the summative performance of the students.

The analysis of the qualitative data was a commentary based on the conversations and discussion which took place in the various discussion groups. The discussion groups have been split into 3 sets for discussion, as illustrated in figure 4.1. Discussion group 1 happened in the second semester of the students' first year; there are 3 instances of this discussion group. The second discussion group took place in the first semester of the second year; there are 2 instances of this discussion group. In all instances of discussion groups one and two there are only computer forensics students. Discussion group 3 took place in the second semester of the students' second year – this group had computer forensics and computer science students.

The quantitative data gathered in this research suggested that feedback interventions provide little positive impact on summative assessment marks and have little positive impact on student achievement. However, due to the structure of the data gathered, the conclusions that could be derived from the quantitative data were limited.

On reflection attempting to gather the quantitative data in a "live" environment as a component of the action research was problematic. In the first year case study the groups were mutually exclusive, and they undertook different assessments so direct comparisons were problematic. In the second case study when the experience of one group of students was compared across two different modules –

the assessments on the two modules were different which meant direct comparison remained problematic. It may have been better to attempt to use a more controlled environment with two groups doing the same tests and one group being given feedback whilst the other did not. On the other hand if a controlled environment had been adopted it would have moved the study away from the action research approach.

## 6.2 Impact of Interventions

### *6.2.1 Case Study 1*

The purpose of this section was to examine the quantitative data gathered in the research project in order to determine whether the provision of formative feedback had an effect on student achievement and the student learning experience.

In order to analyse the impact of the interventions attempts were made to compare the achievement of students who received formative feedback with those who did not. The structure of the interventions was provided in chapter 5.

A range of comparisons were made between the level 1 cohorts in order to determine whether there was a measurable impact on student achievement as a result of the provision of formative feedback.. The full data set on the achievement data gathered is provided in Appendix 4. Figure 6.1 below provides a summary of the comparisons undertaken with the first year cohorts.

| Intervention | Year | Total Population – Cohort (N) | Participants (n) | Numeric Difference in Mean Scores | Match paired T-Test (p value) | F-test | Pearson's r |
|---|---|---|---|---|---|---|---|
| Comparison of CF ass1 and CF ass2 | 2005/06 | 18 | 18 | +6 | 0.0019 | Na | 0.814 |
| | 2006/07 | 29 | 29 | +4 | 0.038 | Na | 0.637 |
| | 2007/08 | 35 | 35 | +3 | 0.013 | Na | 0.696 |
| Comparison of CS ass1 and CS ass2 | 2005/06 | 17 | 17 | +1 | 0.523 | Na | 0.870 |
| | 2006/07 | 20 | 20 | +2 | 0.671 | Na | 0.558 |
| | 2007/08 | 24 | 20 | -2 | 0.081 | Na | 0.897 |
| Comparison of CF and CS module marks | 2005/06 | CF =18<br>CS = 17 | CF = 18<br>CS = 17 | Na | 0.881 | 0.230 | |
| | 2006/07 | CF = 29<br>CS = 20 | CF = 29<br>CS = 20 | Na | 0.727 | 0.135 | |
| | 2007/08 | CF = 35<br>CS = 24 | CF = 35<br>CS = 20 | Na | 0.005 | 0.552 | |
| Comparison of CS and CF level averages | 2005/06 | CF =18<br>CS = 17 | CF = 18<br>CS = 17 | Na | 0.931 | 0.899 | |
| | 2006/07 | CF = 29<br>CS = 20 | CF = 29<br>CS = 20 | Na | 0.699 | 0.641 | |
| | 2007/08 | CF = 35<br>CS = 24 | CF = 35<br>CS = 20 | Na | 0.697 | 0.763 | |

*Figure 6.1 Summary of qualitative statistics results from case study 1*

*Figure 6.1 Key*

CF = computer forensics, CS = computer science, Ass1 = assignment 1, Ass2 = assignment 2

The data in figure 6.1 suggested there is very little that can be derived from statistical significance that showed any impact of formative feedback on student achievement. However, the mean scores for the CF students have increased in each year group whilst the CS mean scores have not. Potentially this could indicate that the feedback has had some effect between assessment 1 and assessment 2 for the CF students. In order to try and measure the impact of feedback an analysis was done using

correlation with the 100 academic points that were common to the CF and CS students – figure 6.2 Further analysis was undertaken using effect size, see figure 6.3.

Part of the trouble in the comparisons both between the CS and the CF students in the first case study and between the 2 CF modules in the second case study is that like wasn't being compared with like because the students in the groups being compared did not take the same assessments. In any event, comparing small samples can be problematic because of the low power of the analysis.

There are issues in comparing assessment 1 and assessment 2 in that the assessments are based on different tests, so the students could have performed differently on these tests irrespective of the intervention of feedback. The students could be expected to perform better in the second assessment, a) because assessment 2 is later in the academic year the students could be "getting better" at assessments anyway, and b) they might have a stronger motivation to improve in their second assessment because they know what arithmetic score they need to achieve in order to pass the module. On the other hand, it could be that the expected student mark in the second assessment would be lower a) because the second assessment could conceivably be more difficult than the first and b) the students performed well in the first assessment so they knew they didn't have to do particularly well in order to pass the module. However, bearing these in mind the attempt is made to determine whether the feedback intervention improves the scores of the computer forensics students.

The nature of the action research in a live environment meant that the groups being compared would not be taking the same tests in their assessment. However, it had been hoped by the author that because in both of the case studies the students were at the same academic level and that the assessments were worth equivalent academic credits, then comparisons would have been achievable. A further argument to justify comparing the groups despite the different tests is that the assessment specifications had been internally and externally moderated, and therefore had been judged independently to be at an equivalent academic level of difficulty. As indicated in the introduction to this chapter a test environment where the treatment group and the control group undertook the same tests would have been beneficial, but because the study was based on real and actual assessment getting students to take the same test would not have been possible. Further, the intention in the study was to analyse the actual impact and perception of feedback and the decision was made in the design of the study to do this by examination of the actual assessments that were part of the students' programme of study.

In order to isolate the impact of feedback on student achievement and find a base line against which the impact of feedback on student achievement could be made. The intention was to use the common

100 points (all the computer forensics and computer science students did the same 100 points worth of academic credit in the first case study in addition to their specialist module) and correlate the achievement on assessment 1 and assessment 2 from the 20 point module against the achievement on the remaining 100 credit points. This was repeated for the 3 cohorts in case study 1. It was hoped that by examining the difference in the correlation between CF assessment 1 with the common 100 credit points with assessment 2 and the 100 common credit points that the impact of feedback on achievement would be observed. The results are indicated in figure 6.2.

| 2005/06 | | | |
|---|---|---|---|
| Programme | Assignment 1 | Assignment 2 | Comment |
| Computer forensics<br><br>N=18, n=18 | 0.861 | 0.932 | correlation similar |
| Computer science<br><br>N = 17, n = 17 | 0.870 | 0.880 | correlation similar |
| 2006/07 | | | |
| Computer forensics<br><br>N= 29, n=29 | 0.361 | 0.368 | correlation similar, but lower than other instances |
| Computer science<br><br>N=20, n=20 | 0.857 | 0.824 | correlation similar |
| 2007/08 | | | |
| Computer forensics<br><br>N= 35, n=35 | 0.526 | 0.659 | correlation similar |
| Computer science<br><br>N= 24, n=20 | 0.760 | 0.815 | correlation similar |

*Figure 6.2 Correlations between individual assignments on 20 point module with achievement on remaining 100 credit points*

If it were the case that the feedback was having a big effect on student learning, one might expect to see two sorts of effect. One would be a bigger gain in the feedback group (difficult to determine here because different tests are used), another is a reduction in the correlation between performances on the CF module test scores from the first to the second test, in comparison between the CS scores. This argument rests on the idea that feedback will not have a uniform effect, but will be beneficial to different students in different ways. However, this is not seen in the correlations presented in Figure 6.2. However, it is noticeable that the correlations for the computer forensics students in 2006/07 in

both assignment 1 and assignment 2 were lower than the other CF year groups and all the CS year groups.

The correlations were calculated in order to determine whether there was a large difference between the correlation between assignment 1 and the common 100 credit points and between assignment 2 and the common 100 credit points. If for example there was a correlation of 0.9 in the first assignment and 0.2 in the second, then it may have been an indicator that there was a change as a result of the feedback. However because there are similar correlations between the correlations in each instance this line of enquiry was not pursued further. Instead an examination of effect sizes was undertaken.

| 2005/06 | | | | | | |
|---|---|---|---|---|---|---|
| Programme | Assignment 1 | | Assignment 2 | | | Effect Size |
| | M | SD | M | SD | Pooled Sample SD | |
| Computer Forensics<br><br>N= 18, N = 18 | 52 | 8.10 | 58 | 7.76 | 8.09 | 0.74 |
| Computer Science<br><br>N = 17, n = 17 | 54 | 9.73 | 55 | 11.20 | 10.34 | 0.096 |
| 2006/07 | | | | | | |
| Computer forensics<br><br>N= 29, n=29 | 52 | 10.41 | 56 | 11.57 | 11.06 | 0.361 |
| Computer science<br><br>N=20, n=20 | 53 | 6.19 | 55 | 8.22 | 7.40 | 0.27 |
| 2008/09 | | | | | | |
| Computer forensics<br><br>N= 35, n=35 | 54 | 7.23 | 58 | 7.33 | 7.51 | 0.53 |
| Computer science<br><br>N= 24, n=20 | 65 | 11.21 | 62 | 8.50 | 9.87 | -0.3 |

*Figure 6.3 Effect Size of Formative Feedback between Assignment 1 and Assignment 2*

The effect size calculation that was used for figure 6.3 was

Effect Size = [Mean $_{\text{end of treatment}}$ – Mean $_{\text{beginning of treatment}}$]/SD

According to Hattie (2009:7) effect size provides a “common expression of the magnitude of study outcomes for many types of outcome variables”. Effect size was used in the analysis of the quantitative data in this study in order to examine the “magnitude of study outcomes”, i.e. to deermine whether formative feedback had an impact on student learning and achievement. There is debate in the literature about when an effect size becomes large. Hattie (2009) quotes Cohen (1988) who suggested that an effect size of 1.0 is large and gives a “blatantly obvious and grossly perceptible difference”. Hattie (2009) argues that an effect size of 0.6 may be considered large in certain circumstances. In addition Hattie (2009:9) argues that there are “many examples that show small effect sizes may be important”.

Irrespective of whether the effect size is deemed large or not, the comparison of the effect sizes between computer forensics and computer science in each of the 3 years of the study would appear to suggest that effect size between assessment 1 and assessment 2 when formative feedback is provided is larger than when formative feedback is not provided.

In order to examine the effect of formative feedback on student achievement, consideration was given to the comparison in module marks between the computer forensic module (received feedback) and the computer science module (didn't receive feedback). The effect size was calculated by

Effect Size = [Mean $_{treatment}$ – Mean $_{control}$]/SD

The results are presented in figure 6.4

| Year | | Computer Forensics Module (treatment) | | | Computer Science Module (control) | | | Effect Size |
|---|---|---|---|---|---|---|---|---|
| | | M | SD | | M | SD | Pooled Sample SD | |
| 2005/06 | N=18, n=18 | 55 | 7.55 | N=17, n= 17 | 54 | 10.19 | 8.81 | 0.113 |
| 2006/07 | N=29, n= 29 | 54 | 9.96 | N=20, n=20 | 55 | 7.14 | 9.93 | -0.01 |
| 2008/09 | N=35, n=35 | 55 | 9.93 | N=24, n= 20 | 64 | 9.59 | 10.65 | -0.84 |

*Figure 6.4 Effect Size comparing Computer Forensics and Computer Science module marks*

The effect sizes in figure 6.4 are small (consensus in the literature is that an effect size < 0.2 is small) and in 2006/07 and 2007/08 are actually negative and is large. The effect size indicates that there is a big difference between the CS and the CF achievement, despite the CF students being the group that received feedback. In order to further examine the situation the overall achievement levels of the computer science and the computer forensics students are presented in figure 6.5.

| Year | | Computer Forensics Overall (treatment) | | | Computer Science Overall (control) | | | Effect Size |
|---|---|---|---|---|---|---|---|---|
| | | M | SD | | M | SD | Pooled Sample SD | |
| 2005/06 | N=18, n=18 | 54 | 7.37 | N=17, n= 17 | 54 | 8.31 | 7.75 | 0 |
| 2006/07 | N=29, n= 29 | 61 | 8.42 | N=20, n=20 | 62 | 7.58 | 8.02 | -0.12 |
| 2008/09 | N=35, n=35 | 62 | 13.40 | N=24, n= 20 | 71 | 13.87 | 13.45 | -0.67 |

*Figure 6.5 Effect Size comparing Computer Forensics and Computer Science Level 1 Overall Summative Performance*

The effect sizes presented in figure 6.5 show small effect sizes in 2005/06 and 2006/07, but again there is a large effect in the 2008/09 cohort. The effect size in 2008/09 for the overall scores again indicates a higher achievement level for the CS students and potentially suggests that the impact of the feedback has been negative for the CF students. This contradicts the findings on the impact of feedback between assessment 1 and assessment 2 discussed earlier and illustrated in figure 6.3. Although this is only one example in a small case study the contradictory findings and the results for 2008/09 suggest that the positive impact of feedback is not as clear cut as the Assessment for Learning movement suggest (e.g. Black and Wiliam, 1998)

Apart from the strong negative effect size results in 2008/09 the analysis of the data using effect sizes does not show very much in terms of the overall impact of formative feedback, although the effect sizes indicated in Figure 6.3 potentially indicate that the provision of formative feedback on assessment 1 may have an effect on assessment 2. However, there are many other potential variables that could have led to the effect sizes. In order to try and isolate the impact of formative feedback a different approach was used in case study 2.

*6.2.2 Case Study 2*

In the comparison of the two mutually exclusive groups in case study 1 it was difficult to isolate the potential impact of formative feedback. Therefore in case study 2 a different approach was adopted. In case study 2 the same cohort of students were given feedback on one module (CM0541) and no feedback on the other computer forensics module on their programme (CM0542). Both modules carried 20 academic credits at level 2. The structure of the level 2 programme of study was provided in figure 2.2. . Figure 6.6 provides a summary of the comparisons undertaken with the second year computer forensics students on their two separate computer forensic modules. The first comparison was intended to look at the impact the mock exam had on the performance of the actual exam in module CM0541. The mock exam used typical examination questions that were of equivalent difficulty of the questions used in the actual examination. The mock examination questions were taken from the pool of previous exam questions for this subject. These questions had undergone external scrutiny from external examiners. The second comparison was between the two computer forensics modules. These two modules were compared because it was hoped that the same group of students participating in modules with different levels of formative feedback would indicate the impact of formative feedback on the levels of student achievement.

| **Intervention** | **Year** | **Total Population - cohort (N)** | **Participants (n)** | **Numeric Diff** | **Match paired T-Test (p value)** | **F-test** | **Pearson's r** |
|---|---|---|---|---|---|---|---|
| Comparison of mock exam and exam achievement | 2006/07 | 22 | 20 | 5 | 0.02 | Na | 0.905 |
| | 2007/08 | 34 | 33 | 8 | 0.03 | Na | 0.828 |
| Comparison of CM0541 and CM0542 module marks | 2006/07 | 22 | 20 | -3 | 0.03 | Na | 0.927 |
| | 2007/08 | 34 | 33 | -5 | 0.165 | Na | 0.208 |

*Figure 6.6 Summary of quantitative statistics results from case study 2*

As with the analysis of the quantitative statistics in case study 1 the quantitative statistics in case study 2 did not indicate a great deal. However, that data was analysed by considering effect size.

Figure 6.7 shows the effect size for the mock exam (beginning of treatment) / exam (end of treatment) situation.

| Year | | Mock Exam | | | Actual Exam | | | Effect Size |
|---|---|---|---|---|---|---|---|---|
| | | M | SD | | M | SD | Pooled Sample SD | |
| 2006/07 | N=22<br>n=20 | 38 | 15.12 | N=22, n= 20 | 42 | 20.3 | 17.86 | 0.22 |
| 2007/08 | N= 34, n= 33 | 42 | 18.57 | N= 34, n= 33 | 45 | 14.99 | 16.68 | 0.18 |
| | | CM0541 | | | CM0542 | | | Effect Size |
| | | M | SD | | M | SD | Pooled Sample SD | |
| 2006/07 | N=22, n= 20 | 45 | 14.29 | N=22, n= 20 | 52 | 13.68 | 13.70 | -0.51 |
| 2007/08 | N= 34, n= 33 | 50 | 8.92 | N= 34, n= 33 | 55 | 10.31 | 9.84 | -0.51 |

*Figure 6.7 Effect Size – Student Marks in CM0541 and CM0542*

In both figures 6.6 and 6.7 the calculated effect sizes were small. A summary of the quantitative analysis is presented in the section 6.2.3.

### *6.2.3 Summary of Quantitative Data Analysis*

The analysis across the 3 years of the studies shows very similar results for each of the years. The analysis of the first year module on computer forensics suggests that there is possibly some degree of improvement in the level of achievement between the first and second assignments for each of the three cohorts as indicated in the raw data in figure 6.1. However, there is also an improvement of in the summative marks between the first and second assessments for the students who didn't receive formative feedback. It is not possible to draw any conclusions from the statistics presented in figure 6.1. When effect size is used to examine the impact of formative feedback between the first and second assignments (figure 6.2), there is an indication that in each of the three years that the

students on computer forensics improved between the first and second assignments. However, it is not possible to attribute this to the provision of formative feedback because there are a range of other variables which could have influenced the results effect size.

The analysis of the first case study suggests that there is not a difference between the student achievement on the module which provides formative feedback and the module that doesn't. When the effect size calculations (figure 6.3 and 6.4) are considered again there is very little to suggest the positive impact of formative feedback on enhancing student achievement. The pattern of grades (figure 6.1) and the low effect sizes, figures 6.2 to 6.5 was not what the author had expected. The expected results were that the computer forensics students would achieve higher marks on the module that they did differently, as a result of the feedback interventions, and that the overall level average would be higher for the computer forensics students than the computer science students.

The unexpected results continued into the second case study. . Attempts were made to reduce the number of variables by studying two modules that the same group of students participated in. Even narrowing the study down to the computer forensics students and comparing their results between a computer forensics module where there was formative feedback (the theory module) and a computer forensics module where there wasn't formative feedback (the application module) the quantitative results did not indicate an increase in achievement as a result of feedback.

The failure of the quantitative data to show the expected impact on student achievement by the provision of formative feedback lead to the next stage of the research design and the use of discussion groups to gather qualitative data as part of the action research process.

## 6.3 Discussion Groups

In this section a summary of the discussions from the discussion groups is presented and the key issues extracted. The student comments included in the appendices are extracts from the discussion group conversations – the details of the data gathered are presented in Appendix 2. In order to analyse the data, the data was collated into themes. The process for determining the themes and the methods used to allocate student comments to the themes is described in section 6.3.1.

The discussion groups were convened in the computer forensics laboratory. The computer forensics laboratory was used as the "base room" for the computer forensics students and it was hoped that the use of this room for the discussion groups would allow the students to feel comfortable. Chairs were set out in a horse shoe shape to enable to the discussions to take place. There were no desks in the horse shoe.

Students were told at the beginning of each discussion group the purpose of the discussion group and their rights, given the ethical rules for conducting research (described in 4.8). The nature of the discussion groups was provided to students with an indication that questions would be used as "prompters" to facilitate the discussion. However, students were free to raise any issues concerns or experiences that they felt were important to them. The questions used in the discussion groups were derived from the literature and from the failings in the analysis of the quantitative data.

### *6.3.1 Method for Categorisation*

In order to analyse the unstructured information from the discussion groups, qualitative data analysis software was used to try and identify the main themes and categories that the students were raising in the discussion. A range of different software packages, including Atlas.ti, Nudist, BEST and NVivo were examined in order to determine an appropriate choice. The software packages were considered in terms of the functionality and usability of the software, mapping this to the complexity of the data that was to be analysed.

The initial intention had been to use a number of software packages and triangulate the outputs in order to ascertain the issues from the perspective of different analysis tools. However this approach

proved prohibitive both in terms of cost of software and in terms of time that would be required to code the qualitative data from the research in this study. In addition the functionality of the software, for example Atlas.ti was much greater than that required for the analysis of the data in this study. A pragmatic solution was adopted and NVivo was selected. The rationale for selecting NVivo was that it was licensed for use at the author's place of work, it would be able to handle the text-based data gathered in the research study, it could be used to carry out the required basic qualitative data analysis and it was simple and straightforward to use.

Using NVivo allowed analysis at a number of levels in order to identify the feedback themes. In the first instance a "word frequency count back" was applied across all the instances of discussion group 1 and discussion group 2. The content of discussion group 3 where examples of feedback were used did not lend itself to the word frequency analysis. An extract from the report indicating the most commonly occurring words is given in figure 6.8

| **Word** | **Count** | **Percentage (%)** |
|---|---|---|
| i | 68 | 8.37 |
| feedback | 31 | 3.82 |
| you | 28 | 3.45 |
| comments | 20 | 2.46 |
| did | 18 | 2.22 |
| me | 16 | 1.97 |
| what | 16 | 1.97 |
| exam | 14 | 1.72 |
| my | 14 | 1.72 |
| help | 13 | 1.60 |
| mark | 13 | 1.60 |
| assessment | 10 | 1.23 |
| got | 10 | 1.23 |
| more | 10 | 1.23 |
| helped | 9 | 1.11 |
| mock | 9 | 1.11 |
| think | 9 | 1.11 |
| don't | 8 | 0.99 |
| understand | 8 | 0.99 |
| where | 8 | 0.99 |
| work | 8 | 0.99 |

*Figure 6.8 Extract from Word Count Analysis*

Whilst the word count analysis was interesting it was not particularly useful in helping to determine the categories or to allocate responses to categories.

NVivo was used to generate individual reports for each of the questions for each of the instances of the discussion groups. The individual coding summary reports are provided in Appendix 5. The returns were then used to identify the weightings from the discussion groups. These weightings indicate the frequency of the topics covered in the discussion groups and are shown in figures 6.9 and 6.10.

Discussion Group 1

| | N cohort size | n discussion group size | Feedback helped | Used feedback in future | Understanding of mark | Feedback personal judgement | Timeliness |
|---|---|---|---|---|---|---|---|
| 2005/06 | 18 | 6 | 33% | 13% | 27% | 24% | 0% |
| 2006/07 | 29 | 8 | 35% | 16% | 17% | 17% | 0% |
| 2007/08 | 35 | 9 | 15% | 12% | 26% | 45% | 0% |

*Figure 6.9 Summary of NVivo analysis for discussion group 1*

Discussion Group 2

| | N cohort size | n discussion group size | Mock useful | Peer feedback | Understanding of mark | Used feedback to change | Timeliness |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2006/07 | 22 | 12 | 20% | 9% | 0% | 41% | 0% |
| 2007/08 | 34 | 16 | 7% | 14% | 0% | 42% | 0% |

Figure 6.10 Summary of NVivo analysis for discussion group 2

### *6.3.2 Discussion Group 1*

As indicated in chapter 5 the first discussion group took place in week 3 or 4 of the second semester, (week 3 in 2006, week 4 in 2007 and week 4 in 2008). The questions used to structure the discussion group are indicated in Appendix 2. The main objective in this discussion group was to encourage students to talk about how useful the feedback on the first assignment had been, how they might use the feedback in the future and what they might do differently as a result of the feedback both for the next assessment in the computer forensics module and for other assessments that they had to do on other modules on their course.

In each of the three years there were some concerns raised about lack of feedback. Students were unanimous in that they expected feedback to be provided, but as this discussion group took place quite early in their academic careers there hadn't been many situations where they had expected feedback so there was not a great deal of complaint about not having feedback or about the timeliness of feedback . They were clear however, that if they handed in work and they didn't get feedback on it, then lack of feedback would become an issue.

The students felt that they should get feedback because they had put a lot of effort into the assessment and that getting feedback was part of the recognition of the effort they had put in, "*I did a lot of work on my assignment so I expect something back from my lecturer to show that he's read it"*, (computer forensics student, year 1, 2007/08 cohort). This aligns with Higgins, Hartley and Skelton (2001) suggestion that students want feedback because they "believe they deserve it". Although the students said they read the feedback there was some evidence to support Adams, Thomas and

King's (2000) suggestion that students only want numeric marks, *"the important thing for me is the mark I get, it's the first thing I look for"*, (computer forensics student, year 1, 2005/06 cohort). The students tended to think of the marks as an indication of their academic ability and when they got poor marks the students felt demoralised, *"I thought I'd done ok, but the mark was lower than I thought and it hit my confidence"*, (computer forensics student, year 1, 2005/06 cohort).

There was a common theme in all the iterations of the first discussion group around what students were expected to do with the feedback and how they should use it. The discussion in the groups concurred with issues raised by Lea and Street (1998) and Nicol and Macfarlane (2004) where it is suggested that students need help in developing their understanding of how to use feedback if it is to enhance their learning. The students indicated that although they had read the feedback they were unsure of how they could use it to improve their subject understanding. Although this was a relatively small concern raised by students it did lead to a change in the author's practice. The outcome from this line of response from students was to implement a teaching session on how to use feedback once it had been provided. This is returned to in more detail in section 6.4

However, rather than talk about what they might do with feedback, it was interesting that many students wanted to talk about justifying their performance in the first assessment for example *"I wasn't exactly sure what it was I was asked to do"* (computer forensics student, year 1, 2007/08 cohort). Other students were more *"it was difficult to give a good introductory overview of a subject in a strict word count without losing a lot of discussion about the subject material*", (computer forensics student, year 1, 2006/07 cohort).

The students in all three years wanted reassurance that they were submitting assessments that were at the appropriate academic level. For example one student suggested that the feedback "*helped me to see what was wanted"* (computer forensics student year 1, 2006/07 cohort). The following example captures the worries that the students shared *"I wasn't sure what detail I was expected to go into, because the questions [the assignment specification] were different to what I'd had at college. I was pleased with the mark I got and the comments said I'd done ok",* (computer forensics student, year 1, 2007/08 cohort).

Linked to the student concerns about the level they should be writing at there was a strong discussion on the development of academic skills. This was common across all three years and particularly strong with the 2006/07 cohort. The students said that they wanted more guidance on referencing,

bibliographies, ways to structure their report and the ways that they were putting forward their arguments.

The discussion around justifying their performance in both the second and third iteration of the first discussion group led on to the student perception that marks and feedback formed a judgement on them by their tutors. The students felt that every time they got a mark or written comment they were being judged and whilst they accepted that this happened they felt that judgements didn't really help in their learning.

### *6.3.3 Discussion Group 2*

At the second discussion group students were asked to consider the type of feedback they found useful and the ways in which they used feedback, particularly with reference to the mock exam intervention in the first semester of their second year, but the discussion group was open to discussion on all topics. The concept of peer assessment was also put forward as an item for discussion in both iterations of this discussion group.

The main issues coming out from the discussion group 2 discussions, in addition to specific discussion about the mock exam exercise, related to feedback on academic skills, personalised feedback and the opportunity to discuss the feedback and feedback within modules. Students also raised concerns about not getting feedback in some modules and not having the opportunity to keep their assessment scripts (including the feedback on the assignment) after they had seen it.

The comments from students suggested that they are not confident taking exams and that they don't get the chance to show what it is that they know. There is a strong suggestion in the literature on assessment that examinations are problematic as an assessment instrument (Rowntree,1987; Elton and Johnson 2002; Falchikov, 2005). It is not the intention to discuss the issues and merits associated with examinations, however, it pertinent to note that comparing a module which has an examination as one of the assessment instruments with a module which doesn't may not be comparing like with like. Other variables, such as exam technique and student stress may be introduced when an examination is part of the module.

The reaction to the mock exam formative activity showed, at least in this particular instance (and in each of the three years) that the students took the formative activity seriously. They were stressed about the mock exam *"not enough time to prepare"* and *"hadn't had the chance to do revision"*. This type of discussion was similar in many ways to the discussion indicted in 6.3.1 where students seemed to need to justify their performance.

As with the first discussion group a large amount of the conversation focussed on the benefits of the formative activities that students felt helped them develop their academic skills. . In particular a common theme coming from the mock exam exercise was that students realised that they had problems in estimating time for exam questions and in managing their time in answering exam questions so that they didn't run out of time. Another academic skill that appeared to be brought to the students' attention in the mock exam was to be careful in answering the question that had been asked and not just to write everything they knew about the topic in the question.

Although there were a few comments about the feedback on the subject matter, *"it [the feedback] helped me understand the issues to think about in maintain evidential continuity",* (computer forensics student, 2006/07 cohort), there were more comments related to the feedback on examination technique, *"timing – I need to work out how long to give for answering each question and stick to it"*, (computer forensics student, year 2, 2007/08 cohort). As well as timing on questions students indicated that they were more aware of needing to answer the question that was asked, "*next time I will take more time to understand the question",* (computer forensics student, year 2, 2007/08 cohort). There were also some comments about using the feedback as preparation for future exams "*I need to do more reading outside of lectures and seminars and go over my notes more"*, (computer forensics student, year 2, 2007/08 cohort). Again this type of comment indicated a more generic academic skills concern rather than a subject specific concern.

The discussion on academic skills improvement as a result of feedback seemed to tie in with the data gathered in the initial studies (figures 5.4 – 5.6) which suggested that students found it useful to receive feedback on academic skills development. The concerns that student had about academic skills development were raised in the first case study. Academic skills development was returned to in the second case study and during the second case study discussions the students gave a positive indication that academic skills were of value to them in their learning.

A number of students used the feedback from the mock exam as reassurance that they were making good progress in the module and that they understood the subject, *"I thought it [the mock exam mark and feedback] was a good indicator of my current knowledge"*, (computer forensics student, 2006/07 cohort), "*good to see what stage I am at and how much I still need to learn and work on",* (computer forensics student, 2007/08 cohort). However, students made this judgment more on the number mark rather than the feedback comments, *"the mark I got was less than I expected and it shows me that I need to work harder"*, (computer forensics student, 2006/07 cohort).

Some students thought it would help by preparing them for the exam *"understanding what sort of questions might come up and getting more understanding of what to write"*, (computer forensics student, 2006/07 cohort). It wasn't just the feedback that students thought would help in preparing them for the exam, but the mock question itself, "*I thought great it can help me to know what to expect in the exam"*, (year 2 computer forensics student, 2007/08 cohort).

In the 2006/07 session students suggested that the feedback provided in CM0541 (the second year computer forensics module that had formative feedback included) on the mock exam actually helped them in CM0542 (the computer forensics module which didn't have formative feedback), *"I used the comments from my mock exam to change the way I was writing up my case study notes in my lab book",* (year 2 computer forensics student, 2006/07 cohort). The cross module use of feedback adds to the complexity of trying to isolate the effect of formative feedback. However, in many ways the difficulty in isolating the effect doesn't matter. The fact that students used the feedback as part of their learning (in this example – in the way that was appropriate for them) is what is important.

There were other academic skills identified as requiring development and not only from the mock exam example. Students raised the development of academic skills such as substantiating points as something they used the feedback for, for example one student stated "*I need to back up my points with more examples and I need to consider more topics in my answers"*, (year 2 computer forensics student, 2007/08 cohort).

The suggestion coming from the students seemed to be that they valued generic academic skills type comments because they see the development of academic skills as something that they can carry forward to future assessments. The students feel that improving academic skills will improve their final grades. They do not see the value in subject specific feedback because they do not think that they will come across the same subjects again and they don't see the links between modules. The findings go

against Hall and Burke's (2003:10) assertion that subject feedback will help students "close the gap between what they can do or know and what they need to do or know". On the other hand the desire for students to improve their academic skills aligns with Yorke's (2003) suggestion that feedback will potentially change student behaviour.

The students in the second discussion group, particularly so in the 2007/08 cohort, introduced the concept of personalised feedback. They felt that personalised feedback and that they were more likely to consider, *"this feedback was personalized and showed areas for improvement and areas of strength along with the mark achieved"*, (year 2 computer forensics student 2007/08 cohort). The students compared feedback which included their name and they preferred it to one experience they had when a tutor provided a feedback sheet that covered comments on the assignment but tried to cover every aspect of the assignment, *"the tutor tried to make sure we understood what they wanted for the answers, but I didn't think it meant anything to me because I was happy with my mark",* (year 2 computer forensics student 2007/08 cohort). This last comment suggested that in this situation the student would only read the feedback if they achieved a lower mark than they had expected.

The students in the second discussion group – in both instances of the discussion group – raised issues around the timing of the feedback. They didn't seem to be too concerned about the speed of feedback but they wanted it before they tackled the second assessment within the module. The following comment illustrates the student perception, *"feedback during a module, it's useful to know where you are going with a piece of work before the module is finished. Most feedback is after a piece of work has been marked, some of this feedback is useful but, if it is topic specific, then in general it will never be considered again"*, (year 2 computer forensics student 2007/08 cohort). This comment also indicates that students liked to have comments on their draft work before they handed a piece of work in and also that as far as the students were concerned, feedback at end of a module was not much use to them.

The students appeared to like the idea of submitting a draft outline of their assignment and getting comments on the draft. They felt that they were more likely to use the feedback in developing the final version of an assignment than use feedback in other modules later in their course. The students indicated that this had happened on one module in their experience and they had found this useful *"getting feedback on the draft helped me to see where I had to do more work"* (year 2 computer forensics student 2007/08 cohort).

The concept of peer assessment and peer feedback was introduced to the discussion in both instances of the second discussion group. Peer assessment has been promoted by a number of academics as an innovate way to encourage engagement with feedback and provide student with greater ownership of their learning, (Boud, 1989; Sambell,1999; McDonald and Boud, 2003; and Falchikov, 2005). The students had little experience of peer feedback, although it was used briefly in the presentation exercise at the start of second year, as discussed briefly in section 5.4.1. The students were not receptive to the concept. They did not think that the brief experience they had on peer assessment had been useful and both groups of students suggested that they would value tutor feedback more than student feedback, *"I didn't like giving feedback to the other students and I didn't think that the feedback back I got from the other groups was very helpful"*, (year 2 computer forensics student 2007/08 cohort).

### *6.3.4 Discussion Group 3*

In discussion group 3 in both instances there were computer science students as well as computer forensics students. Figure 6.11 shows the number of participants in each of the discussion groups (n) and the total population of students that the participants came from (N).

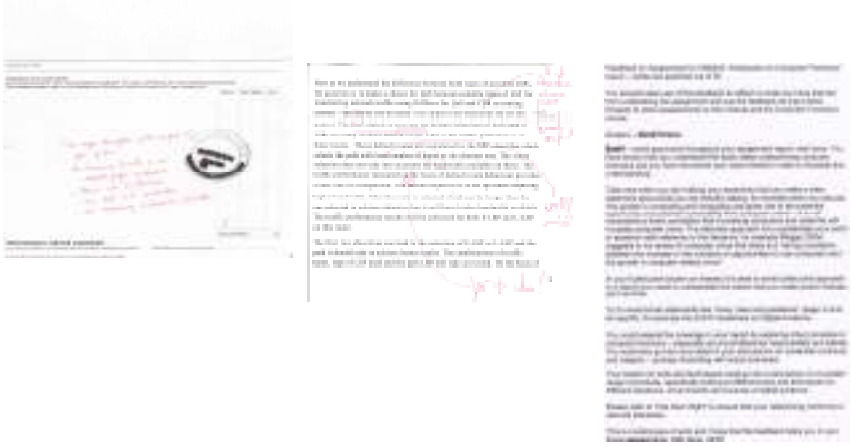
| | N | n |
|---|---|---|
| 2006/07 | | |
| Computer Forensics | 22 | 8 |
| Computer Science | 26 | 2 |
| 2007/08 | | |
| Computer Forensics | 34 | 7 |
| Computer Science | 29 | 1 |

*Figure 6.11 Participation in Discussion Group 3*

A different approach was used in discussion group 3. Rather than use the NVivo approach described for discussion groups 1 and 2 the students were shown a series of feedback styles, and asked to rank them in order of how useful the examples would be in helping them learn about their assessment.

In each year of the discussion groups students raised the concern that they did not understand the feedback that they were given and that they did not know what to do with it. In order to explore the issue of understanding students were given a number of examples of formative feedback from summative assignments, see figure 6.12 (Appendix 3 shows the examples in a larger scale). In

addition to the examples included in the figure below, students were shown one blank page with a number as a means of representing feedback with grade only.



Feedback example 1
front sheet comments

Feedback example 2
annotated comments on script

Feedback Example 3
individualused feedback

*Figure 6.12 Examples of Feedback styles shown to students in discussion group 3*

At the third student discussion group students were shown examples of types of feedback and these were used as the basis for the discussions although the students were free to talk about any aspects of their assessment. The key objective in this discussion group was to get students to discuss what it was that they understood from the feedback they had experienced during their first two years but also to consider the examples presented.

In each of the discussion groups the students were clear that they expected more in terms of feedback than just getting a mark. However, there was a counter discussion (in the 2007/08 discussion group in particular), where students admitted that they were only really interested in the mark and only read the feedback when they didn't agree with the mark or grade they were expecting. Further, when they were reading the feedback in this way they were looking for reasons for marks being lost rather than comments on how to improve for the next assessment or to "close the gap" on their understanding.

However the example with the annotations on the script, shown in Figure A2, generated a great deal of discussion. The students raised many concerns about the style of comments and the language used in the comments. All the students in both groups agreed that the capitalisation and the three

exclamations marks with the word “NO !!!” was very demotivating *“I hate it when they [tutors] write comments like that, and I don’t even know by they mean by it”*, (year 2 computer forensics student 2007/08 cohort). As well as indicating that comments such as “no !!!” were not constructive the comment indicates that students don’t understand the feedback they are provided with. This fits in with Maclellan’s (2001) suggestion that there is a discrepancy between students and lecturers as to what constitutes helpful feedback.

A number of students in both instances of the discussion group agreed that the circling of words was something that *“drove me crazy, why do they do it”* (year 2 computer forensics student 2007/08 cohort). Some students indicated that they thought circling was useful in that it pointed out where a mistake was made and they looked for comments to explain the circle. However, this argument was countered with students, particularly in 2006/07 group saying they’d had lots of examples where there were circles with no comments. Not quite so annoying for students but another example of tutors using symbols that students didn’t understand were squiggles. “*I had one assignment when he’s put squiggly red lines beside some sentences – I just didn’t know what this meant, I didn’t even know if it was good or bad”,* (year 2 computer science student, 2006/07 cohort).

On example A1 the students also focussed on the corrective comment at the bottom of the example, “yes it does”, “*it’s ok to have mistakes pointed out to us, but it is better to have it done in a positive way – I really didn’t like the tutor “arguing” with the answer*”, (year 2 computer forensics student 2007/08 cohort). One student said that *“if I had feedback like that I wouldn’t read any more”* (year 2 computer forensics student 2006/07 cohort). Similar types of student comments were also found by Mutch (2003) who raised concerns that feedback may be categorical in tone and not particularly explicit.

In example A1 none of the students understood what the numbers 1 and 2 related to. This led into a further discussion about understanding feedback. “*I often just don’t get what the tutor is trying to get me to understand. The only way I’ve sorted it out is to ask”*, (year 2 computer forensics student 2007/08 cohort).

Both student discussion groups said they liked the feedback styles in A1 and A3, the use of front sheets helped them summarise how they had done on the assessment. *“I like feedback on one sheet it shows me clearly what I’ve done right and wrong”*, (year 2 computer forensics student 2007/08 cohort). However, in the example in A1 the students didn’t like the feedback to start with a negative

comment, a common view was that “comments like that first one put me right off – I get dead annoyed when I get comments like ‘too vague’, it just doesn’t help”, *(year 2 computer science student, 2006/07 cohort).* Other students complained that they couldn’t read the tutor’s writing *“there were lots of words I couldn’t make out – why don’t they type”,* (year 2 computer forensics student, 2006/07 cohort).

Not understanding the language or the symbols, not being able to read the writing, getting negative comments all of which were illustrated in the examples are reasons why students don’t engage with feedback, as indicated by the comments. Certainly the students don’t engage with the feedback in the way that the tutor’s expect them to. The examples from the discussion group appear to agree with concerns raised widely in the literature (Chanock, 2000; Higgins et al, 2002; Weaver, 2006) that students don’t understand the feedback they have been given.

Students who didn’t feel that the feedback was helpful wanted more detail “*it [the feedback] didn’t give me enough information or give examples of how I could improve*”, (computer forensics student, 2006/07 cohort). However, even in example A3 where the students thought that there was a lot of constructive help they were concerned that *“there was too much to take in, it wasn’t clear what the tutor thought was good and what was bad”*, (computer forensics student, 2006/07 cohort). As with the student comments discussed earlier the students felt that the way to understand the type of feedback shown in example A3 was to discuss it with their tutor.

There are examples in the literature advocating the use of dialogue for example Black (1999), Higgins et al (2001), Nicol and Macfarlane-Dick, (2004), and Hyatt,( 2005). The students suggested that they want one to one feedback and discussion about their feedback, *“I find interactive feedback with lecturers helpful as you get to discuss what the problems were and are able to get a better understanding of what was required of you”* (year 2 computer forensics student, 2006/07 cohort).

In discussion with the students it became apparent that they want the discussion on feedback to be tutor led rather than them asking questions, “I went for face to face feedback discussion but I didn’t know what to ask really, apart from asking about what some comments meant”, (year 2 computer forensics student, 2007/08 cohort). The students see the opportunity for dialogue to be the chance for detailed discussion about their work, “*I really felt good when the time finished [one to one session], it was like the penny had dropped and I knew what the assignment was about”*, (year 2 computer forensics student, 2006/07 cohort).

However the students don't only want verbal feedback, whilst they find discussion useful they want written comments to keep for later use*, "I find written feedback very important. One on one time with a tutor or lecturer is a good way to gain feedback but I often find it difficult to remember everything they have said and advised. Written feedback however is ideal for me as it is a 'solid' piece of feedback for me to keep and look at whenever needed",* (year 2 computer forensics student, 2007/08 cohort).

One particular computer forensics student summed up the feelings of the group on face to face sessions, *"highlights the key points which I had done well to get me the bulk of the marks for the assignment along with criticisms of areas where marks were lost or of where areas could have been improved to increase the results. Having this done in a written format with a one to one 5min conversation with the lecturer about the feedback is helpful as the verbal feedback enables the lecturer to explain more precisely what they thought and the written feedback is useful to refer to enable me to refresh my mind about what the lecturer was speaking about",* (year 2 computer forensics student, 2007/08 cohort).

The way academics communicate with students about their feedback can have motivating and potentially de-motivating consequences. If feedback is communicated constructively and openly it can give students the confidence to ask questions, to discuss their work and find out more about their subject as well as any errors or misconceptions they might have.

The third discussion group, in both instances, provided a great deal of important qualitative data on the usefulness of different types of feedback and ways in which students use, or in some cases don't use, feedback. The groups highlighted the issues around language and symbols in feedback and how this could be construed negatively by students. The groups also indicated that they valued the opportunity to discuss the feedback with their tutors but wanted the conversations to be led by the tutor rather than by the students.

### 6.4 **Outcomes from Findings**

The findings from the analysis of the qualitative data suggested that students want and expect feedback, and they want feedback that they can understand and that they can use in their learning. The analysis indicated that there are issues in the type of feedback that is given to students, in that they think that feedback can be helpful, but they want feedback that is personalised, is given 1 to 1 and face to face. One of the findings from the analysis of the qualitative data was that the students taking part in this research wanted generic academic feedback rather than subject specific feedback or feedback that corrected mistakes. The reason that students gave for this was that it was academic skills improvement that they felt that they could carry forward to future learning.

Although the results from the quantitative analysis were inconclusive the qualitative analysis suggested that there were some interventions which enhanced the student learning experience and potentially had an impact on their levels of achievement. Three interventions were extracted from the outcomes and used to change the author's practice in the provision of feedback. The three were

- Exam intervention
- Academic skills development, and
- What to do with feedback

### *6.4.1 Exam Intervention*

The opportunity for students to get feedback on a mock exam question appeared to have a positive impact on the achievement in the actual examination. The practice of giving a mock examination and feedback on that examination has been used by the author on other models and was used as an exemplar to encourage other academics in the author's place(s) of work to adopt a similar model. The model of practice that was shared is illustrated in figure 6.13.

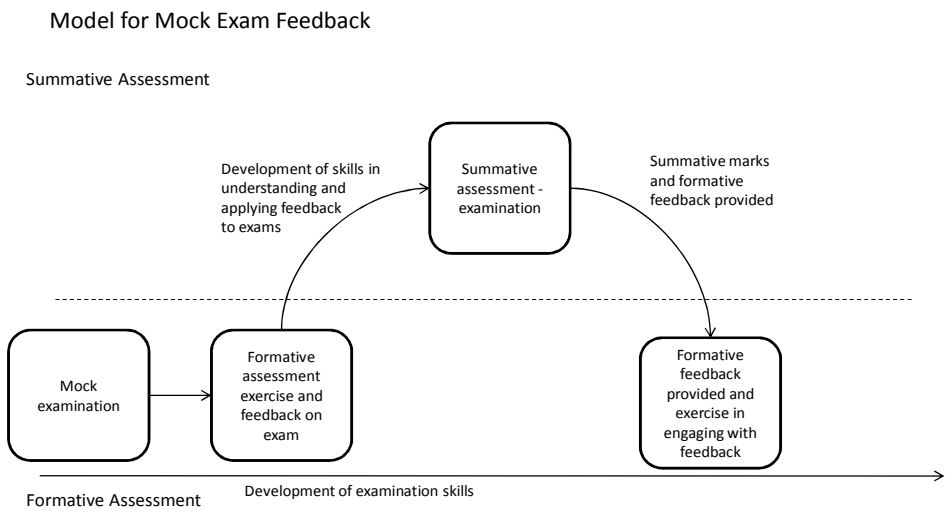



*Figure 6.13 Model of Feedback Intervention for end of module examinations*

### *6.4.2 Academic Skills Development*

Feedback from the student discussion groups suggested that students wanted generic academic skills feedback rather than subject specific feedback or feedback that corrected mistakes. This finding contradicted one of the pillars from the "Assessment for Learning" literature where it was suggested that feedback should be subject specific. The reason that students gave for this was that it was academic skills improvement that they felt that they could carry forward to future learning. The model of developing academic skills throughout an academic programme is illustrated in figure 6.14. In adopting this model into practice it was found to be important that the academic skills being developed through formative feedback were linked to the next formative and / or summative assessment to provide the students with the chance to practice their skills.

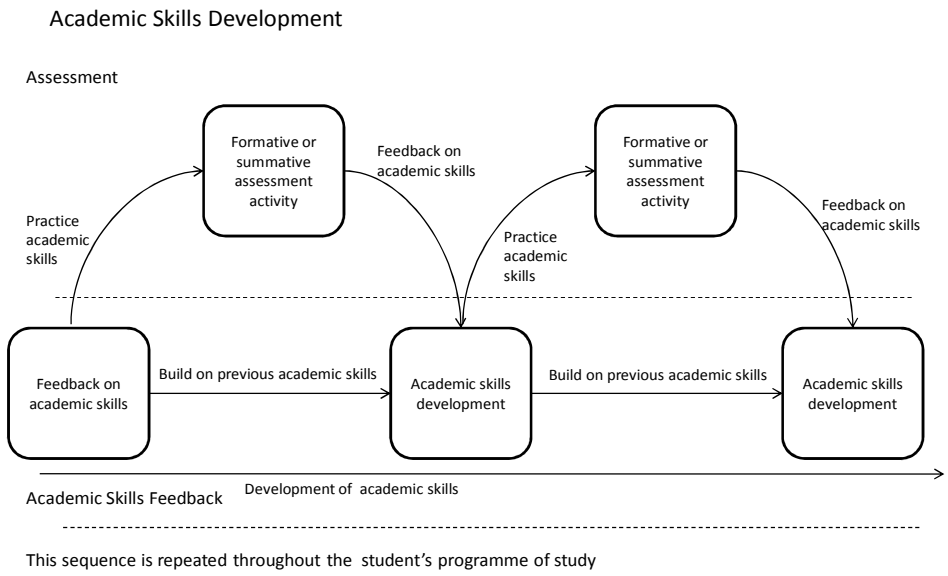



*Figure 6.14 Model of Academic Skills Development through Feedback*

### *6.4.3 Helping Students Understand what to do with Feedback*

A strong message that was relayed during the discussion group sessions with students was that students were unsure how to make use of feedback or even what the feedback actually meant. In order to address this in the author's practice a tutorial on what to do with feedback was integrated into the teaching scheme for the modules that the author taught. This tutorial encouraged students to think about what the feedback provider was trying to convey, think about the wording of the feedback and consider how the comments could be used as feedforward to future learning.

## 6.5 Chapter Summary

In this chapter the quantitative data has been presented and discussed. The empirical evidence that feedback increases student scores was weak, but the study design had too many flaws to support robust conclusions. The conclusion from the analysis of the quantitative data is that it was not possible in this study to determine whether there was an impact on the student learning experience

based on the analysis of summative marks. There is however, little evidence to suggest that the feedback interventions have an adverse effect on student learning. The quantitative results were not those that were expected. It was expected that the feedback interventions would improve the students' summative marks and a claim could be made that the feedback interventions enhanced the student learning experience.

The qualitative studies produced a number of interesting results. The results were not conclusive but there was an indication that students expected feedback, whether they chose to use the feedback or not. The evidence from the student discussion groups suggested different expectations than those indicated in the literature. The literature suggested that there should be a discussion on improving subject based skills and using this in feedforward. However the students seemed less interested in subject based feedback and wanted feedback on academic skills. The students felt that the academic skills development was the most useful in feeding forward in their academic careers. The conclusions from the data presentation and analysis will be discussed in more detail in chapter 7.

# Chapter 7 Conclusions and Recommendations

## 7.1 Introduction

The purpose of this chapter is to bring together the findings of the thesis and suggest recommendations and opportunities for further work on the topic of formative assessment and formative feedback. The research undertaken in this thesis has attempted to determine the nature of the relationship between the provision of formative feedback and student achievement.

The literature on feedback and assessment has been discussed in the thesis in order to identify the issues associated with formative assessment and formative feedback. A research study was designed which involved action research and case studies to examine the impact of formative feedback interventions on groups of students studying computer forensics and comparing these groups of students with computer science students who had not received the same level of formative interventions.

Quantitative data based on the students' summative performance were collected for both computer forensics and computer science students over a 3 year period, covering academic years 2005/06 to 2007/08. The data covered 3 sets of first year cohorts and 2 sets of second year cohorts. Analysis of the quantitative data was inconclusive but suggested that despite formative interventions and the provision of detailed formative feedback for students there was little or no correlation between the provision of feedback and student achievement.

Qualitative data were gathered over the same period via a series of discussion groups. The discussion groups took place at different points in the academic calendar. Analysis of the qualitative data indicates that students want and expect feedback. They want feedback that they can understand and they want feedback that they can use in their learning. Included in this chapter is a discussion on the value of the work undertaken in the thesis based on the relevance of the research findings and to indicate potential areas for further work in the subject area of assessment and feedback.

## 7.2 The Contribution of the Thesis

In this section the value of the work undertaken in the thesis is discussed and the findings of the thesis linked back to the literature review. It is hoped that the findings from this thesis will contribute to the debate on the general effectiveness of AfL and to the application of AfL in Computing disciplines.

The research undertaken in this thesis has shown that students are concerned about the feedback that they get as part of their learning, but also that addressing the issues associated with formative feedback is problematic.

Many of the issues associated with assessment and feedback have been raised in the wide body of literature on assessment and feedback, but the research in this thesis provides evidence to suggest that the relationship between feedback and improved student learning experience is not straightforward. The results from the case study are unique in that the case studies are set in the computing domain and very little of the AfL work has been done in computing. The case studies provide evidence which is different from the majority of mainstream views on the impact of feedback. As such the findings should be of interest to practitioners in Higher Education, educational policy makers and students.

A number of issues were raised from the review of the literature in chapter 3. There is a large body of literature – advocates of Assessment for Learning – that promotes the use of feedback as a means to encourage student learning (e.g Black and Wiliam 1998). In particular the AfL movement highlights the value of formative feedback. Other authors (e.g. Smith and Gorard, 2005) have taken issue with the AfL findings. The evidence from this thesis, although inconclusive, suggests that the link between formative feedback and student achievement is not as conclusive as it appears to be portrayed in the AfL literature and is difficult to measure effectively.

The literature on feedback also suggests students want feedback (e.g Hyland 2000) and value feedback (e.g Weaver 2006) but also that not all feedback is perceived to be useful by students (e.g. Hounsell et al 2006). The qualitative data gathered in the case studies indicates some support for this claim. The students who participated in the case studies agreed that when feedback was available they sometimes found it useful, but it was important that the feedback was structured and was understandable.

A number of authors (e.g. Nicol and McFarlane-Dick, 2004) suggest that feedback should be specific to the tasks being assessed and that generic academic feedback is “lazy”. However, the findings in this study indicate that students want to have academic skills development as part of their feedback because this is the type of feedback that they can feedforward into future modules.

### 7.3 Answering the Research Questions

The findings in the case studies are inconclusive but do raise questions about the findings presented by Hattie, (1987); Sadler (1989); Black and Wiliam,(1998); Torrance and Prior (1999); and Hounsell (2004) who argue that formative activities will improve the student learning experience and student achievement. However, the findings in this case study do reinforce findings by other such as Askew and Lodge, (2000) who suggest that there is little correlation between formative feedback and the enhancement of student learning and Crisp (2007) who suggests that feedback on its own is not enough to improve student learning or improve student levels of achievement.

In addressing the main research question - *can formative feedback enhance the student achievement?* – the findings from this research indicate that the relationship between the provision of feedback and student achievement is not clear. The findings from the quantitative data collected in this research indicate that there is little correlation between feedback and enhancement of student learning experience. The use of summative marks as a measure of enhancement of student learning indicate in this study that there is little or no positive impact on the summative scores on a module which uses formative feedback compared with a module which does not provide formative feedback.

The qualitative data collected suggest that students want feedback, and get upset when they don’t get feedback, but they are unsure how to use feedback to improve their future learning at subject level.

The qualitative data collected suggest that students do use feedback to reflect on their academic skills and value comments on academic skills development. The students in the case studies believed that they were more likely to use the feedback on academic skills in future assignments as opposed to subject based feedback. The subsidiary research questions are summarised below.

### *7.3.1 Why do students want feedback ?*

Students want feedback for a number and a variety of reasons. Different students want feedback for different reasons. The reasons why students want feedback was discussed in detail in the discussion group commentaries in chapter 6. Summarising these discussions students want feedback because:

- they feel it is part of the assessment process and is their right, and they do not like it when they don't get feedback;
- feedback potentially provides reassurance; and
- feedback gives them an indication of where they are in their level of understanding.

### *7.3.2 What students do with the feedback provided to them ?*

This question was explored in the discussion group commentaries and proved difficult to unpick. Students seemed reluctant to fully discuss what they did with their feedback. However, a number of students did indicate that they just wanted a numeric mark or grade and that they only read feedback if they thought their grade was lower than they expected. Other students indicated that they read the feedback and thought about what it meant for their learning. Students seemed more interested in receiving feedback on academic skills than subject specific feedback because they felt that this would help them in future assessments. Students did not consider using feedback to "close the gap" on their learning or to use in "feedforward" for future assessments. The exception to this was when there was the opportunity to use feedback from the first assessment in a module to help with the second assessment in the same module.

### *7.3.3 Can student performance be improved by the provision of feedback ?*

The findings from this study on whether student performance can be improved by the provision of feedback are inconclusive. The quantitative data gathered in the case studies does not provide detailed evidence to address the question. The qualitative data gathered suggests that students want and expect feedback, but there is little to support the claim that feedback improves student performance.

### *7.3.4 How do students use feedback to enhance learning ?*

In many respects the findings in this thesis suggests that students don't use feedback to enhance their learning. There was qualitative evidence of using feedback to improve on academic skills, but

there was little qualitative or quantitative evidence to support the assertion that students use feedback to enhance their learning.

### *7.3.5 What do students think is useful feedback ?*

There was a range of views in what students thought was useful in feedback. Comments on academic skills were perceived to be useful and students found it useful to talk to tutors about their assessments after they had received feedback. Students liked feedback to be on one page in summary form, but they also like annotated comments throughout their assessment scripts (when they could read the comments).

### *7.3.6 Can the case study material from this thesis be used to promote change in academic practice?*

The consideration of whether the material from this thesis could be used in promoting change in academic practice is considered in section 7.4 below.

## 7.4 Implementation

One of the initial objectives of this thesis was to provide case study evidence which could be used to promote change of practice in the provision of feedback in the School of Computing, Engineering and Information Sciences (CEIS) at Northland University. However, since the start of the project the author has changed job and is now working in the Department of Computing, Engineering and Technology at the University of Southland. The intention had been to use the findings from this project to develop a feedback policy for CEIS, however, that intention won't be realised given the change in affiliation, but will be used in the development of feedback provision in the author's new department and will have an impact on future academic practice.

The quantitative results from the study do not substantiate the claim that the student learning experience would be enhanced by providing more formative assessment and more formative feedback so using the results as a lever to promote an increase in the provision of formative feedback, quantity and quality lacks credibility.

However, the author's change of job and of affiliation affords a new opportunity to address the provision of feedback for students. Instead of wholesale change and the development of a feedback policy, a strategy of encouraging a number of pilot studies to try out feedback approaches has been put in place. Volunteers from academic staff have agreed to try out different approaches to the provision of feedback, these include:

- the provision of formative feedback on draft work;
- getting students to indicate the feedback that they want before they hand in their work for comment; and
- use of group feedback, providing generic feedback to all students based on a sample of student work being marked.

## 7.5 Comparison with Other Studies

There have been a number of projects in Higher Education which were designed to enhance the provision of feedback on assessment. Two studies which cover similar ground to this thesis are the

i) Enhancing Practice project instigated by the Quality Assurance Agency (QAA) Scotland

ii) Engaging Students with Assessment Feedback (ESWAF) an Fund for the Development of Teaching and Learning 5 (FDTL 5) project running from 2003 to 2008

### *7.5.1 Enhancement Theme – QAA Scotland*

The Enhancement Theme project had a number of separate topics which were of particular concern in Higher Education designed to enhance academic practice. One of the first themes that the project explored was “Assessment” and one of the major topics in the “Assessment” theme was “Feedback”. The Feedback section of the project identified themes in terms of

- Rethinking formative assessment in Higher Education – identifying 7 pillars of good feedback practice
- Understanding the economies of feedback
- Formative feedback and student success
- Improving feedback to students

The 7 pillars of good practice in the Enhancement Theme project were aspirations about what feedback should be about. Two of the 7 pillars, “encouraging dialogue around feedback” and “providing opportunities to close the gap between current and desired performance” are topics that have been discussed in this thesis although they have not been central issues.

The economics of feedback provision has been briefly alluded to in this these but is outwith the context of the current study.

The arguments put forward in the section on formative feedback and student success have resonance with this thesis in particular the finding that formative feedback is rarely used to its fullest advantage. It is also recognised that it is a demanding challenge to give formative assessment greater prominence. The difficulties in promoting change in formative assessment practices were apparent in the current study.

The Enhancement Theme project looked at the link between formative and summative assessment and this has also been a central aspect of this thesis. The Enhancement Theme project identified student use of feedback as an area which required further work. The concerns about engagement with feedback have been discussed in this thesis.

### *7.5.2 ESWAF*

The ESWAF project was an FDTL 5 project which had the aim of enhancing student learning by improving student engagement with assessment feedback. The main findings of the ESWAF project focussed on the lack of student engagement with feedback. The lack of student engagement with feedback is an issue that has been raised in this thesis. The ESWAF project suggested that students had difficulty in engaging with feedback because of

- The quality of feedback
- Confusion about what constitutes “useful” feedback
- Difficulty in applying and understanding feedback

The research undertaken for this thesis also found that students were concerned about the quality of the feedback they received and had difficulties in understanding and applying the feedback they received.

The ESWAF project goes on to recommend that there is an appropriate environment created which encourages student engagement with feedback. The need to create an appropriate environment for engagement with feedback is a subject that has been identified in this thesis if students are to be given the opportunity to use feedback to enhance their academic achievement.

## 7.6 Recommendations

The recommendations from the thesis are split into three subsections: students, academic staff and Higher Education Institution.

### *7.6.1 Recommendations for Change in Student Practice*

The majority of the recommendations from this thesis are aimed at changes in academic practice and for institutions to provide the support for the changes to take place. However, there are aspects of the recommendations which require student participation, including

- Willingness to engage with formative feedback and act on the suggestions provided in the feedback (but see recommendations for academics); and
- Willingness to enter into dialogue with tutors about feedback

### *7.6.2 Recommendations for Change in Academic Practice*

The key recommendations on change in academic practice are;

- Academics should review their current practice in the feedback they provide for students and ensure that when feedback is provided it is understandable and useable by students;
- An appropriate environment should be created which encourages student engagement with feedback;
- Students should be encouraged to use feedback to "close the gap" on their understanding. Academic staff need to provide structured opportunities for that to take place;
- Academics should provide help to students to help the students understand how to make use of the feedback;
- Students should be provided with the opportunity to discuss their feedback with academic staff on a one to one basis.

### *7.6.3 Recommendations for Change at Institutional Level*

In order to affect a change in practice in the provision of feedback support from the Higher Education Institution is required. There is a need for HEIs to

- Provide staff development sessions to tell staff about student perceptions of what is poor/useless feedback;
- Provide staff development sessions to flag up the importance of staff-student dialogue about assessment and feedback;
- Implement changes in workload management and institutional assessment strategies to allow "space" for feedback to be provided;
- Consider the modular system of education and the adverse impact it has on the feedforward aspect of feedback.

## **7.7 Personal Development**

Undertaking this research study has led to a number of changes in the author's own practice. The elements of practice identified in chapter 6, exam intervention, academic skills development and helping students understand feedback have been incorporated into the author's teaching practice.

A number of opportunities have been taken to share the findings from the case study. Conference papers have been presented at the 40th Annual Frontiers in Education Conference (2010), Higher Education Academy Assessment Conference (2008) and at the EARLI SIG Conference in 2006. In addition staff development papers (internal to university) have been published to disseminate ideas on formative feedback development. Staff development seminars have been held at both Northland and Southland Universities. In addition the findings from this study have been included as part of the curriculum on assessment on PG Cert in Education at Southland.

A further impact on the author's practice has been to utilise the educational research principles developed in the course of this research study. The process of evaluating activities and attempting to measure the impact of interventions has been adopted as part of the author's reflection on teaching practice.

The most significant impact from a personal point of view is that the work undertaken for this thesis contributed to the author receiving the recognition of a National Teaching Fellowship Award from the Higher Education Academy in 2010.

### 7.8 Future Study

There are a number of potential additional research directions which naturally flow from this thesis and its findings. Firstly, the context of this research has been confined to a set of case studies based in one department in one post-92 Higher Education institution. The natural progression would be to replicate the research with other Computer Science departments and then extend to other post-92 institutions and then draw comparisons. A further extension could be to carry out similar research in the pre-92 institutions and then draw further comparisons. Extending the case study range would provide a larger base from which to extrapolate conclusions. One conjecture is that the non-alignment of the findings of the research here and in the research literature arises from the overall course structure; essentially modules which all contribute to student knowledge about computer science, but

which address rather different subject matter and which are not necessarily hierarchically related. Investigating a wider set of Higher Education institutions would also provide a wider range of pedagogic approaches and academic experiences.

Secondly it would be useful to extend the case study by increasing the range of disciplines included in the research. This would allow for comparisons between disciplines and would potentially allow for investigation of the discipline on different pedagogic approaches to formative assessment and formative feedback.

Thirdly, evidence from this study suggested that students had difficulty in appreciating the value of subject based feedback because they were not clear where they would use the feedback in future modules. As discussed in the recommendations for HEIs there are questions about the value of feedforward, but it also raises questions around the modular structure of academic programmes. Further study in comparing the use of feedback on modular programmes with holistic or non-modular programmes would provide a further evidence set on the impact of feedforward.

Fourthly, the use of technology in education to aid in the provision of feedback could be introduced into the research design. Technology has purposefully been excluded from this thesis in order to allow examination of the fundamental principles associated with formative assessment and formative feedback, but there is no escaping the potential opportunity in terms of efficiency that may be afforded by the use of technology. For example an investigation into ways to personalise feedback but without the stress of face to face interactions – possibly through the use of audio feedback (Rotherham 2009) or personalised ICT feedback.

Finally the view from other stakeholders in Higher Education is required. This would involve seeking the views of key people in management in Higher Education institutions as well as from colleagues in national bodies such as the Quality Assurance Agency and the Higher Education Funding Council for England (HEFCE). Significant changes in the provision of formative feedback require changes in academic workload expectations and workload management. It may well be the case that in order to implement change in the provision of feedback and address the student concerns raised in the National Student Surveys that the funding model is amended to provide workload opportunities for academics to give students the feedback they want.

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Appendix 1 Feedback to Computer Science and Computer Forensics Students from Software

For both computer science and computer forensics students there is an element of feedback built in to many of the tasks that they undertake as part of their skills development, see appendix 1 for typical examples of the feedback they get as common tasks in both disciplines. For example computer science students undertake programming as a standard part of their undergraduate studies. All programming languages provide immediate feedback when students attempt to compile their programmes, see Figures A.1 to A.4.

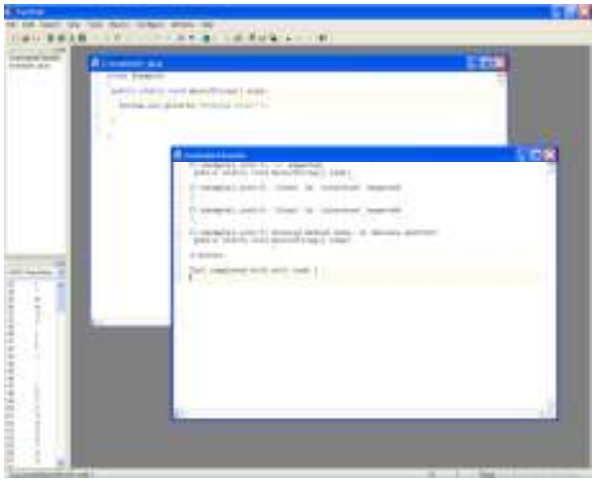


*Figure A.1 Example of Java Compiler Feedback*

The example of feedback given in figure A.1 lets the student know that a curly bracket ' }' is missing. Figure A.2 shows the feedback after the programming error has been corrected.

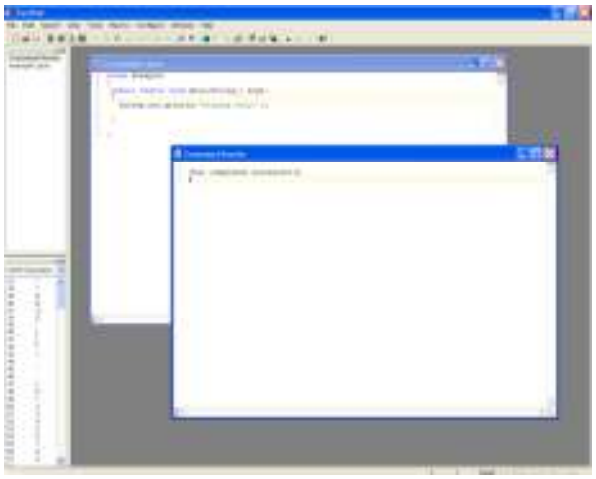


*Figure A.2 Example of Java Compiler Feedback after error has been corrected*

Another example of feedback from a Java compiler is shown in figure A.3 and the feedback from the compiler in figure A.4 shows the output from the corrected programme code. This shows an example of a missing semi colon ';'.

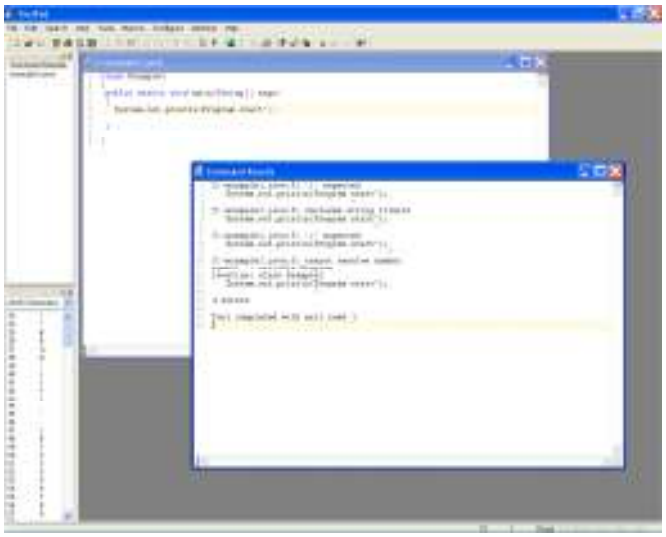


*Figure A.3 Further example of Java compiler feedback*

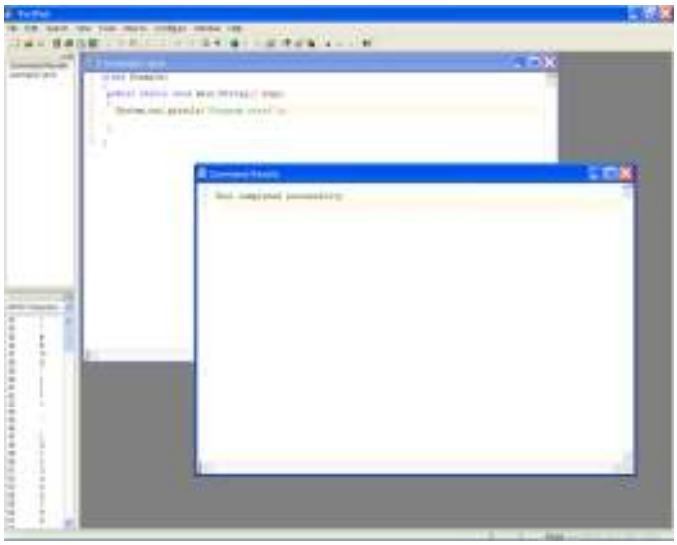


*Figure A.4 Further example of Java Compiler Feedback after error has been corrected*

Depending on the quality of the complier this provides useful information on errors made on the programme, but doesn't normally provide information on how to put things right. Interestingly in discussions with students (discussed in focus groups) none of the students identified messages from the compiler as a type of feedback – there is an expectation from students that feedback is provided by a tutor or a peer.

Computer forensics software also provides immediate feedback to students on their investigation development and investigation completeness, see figure A.5 – A.8.

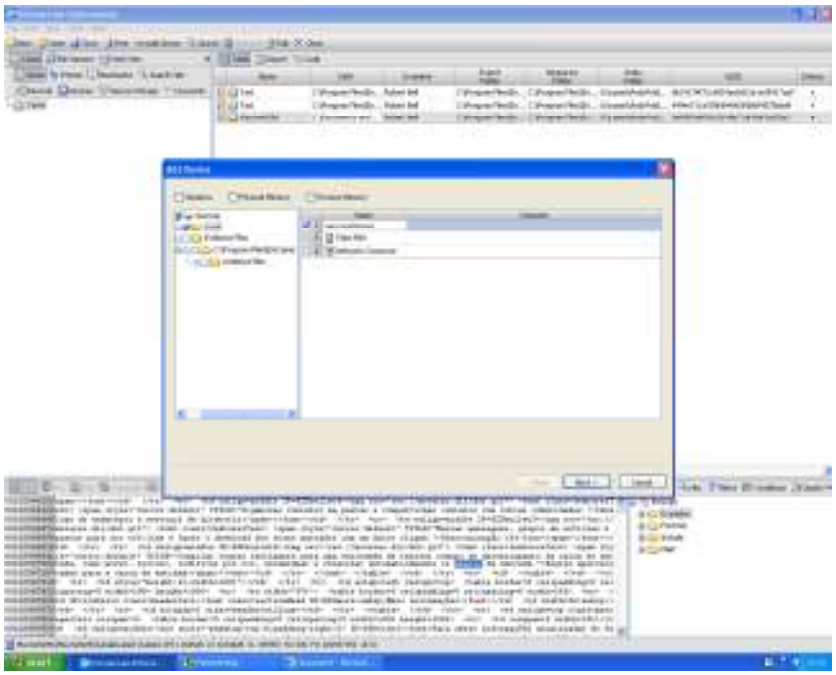


*Figure A.5 Feedback generated by EnCase © - Devices Selected*

This screen provides information on the devices selected for an investigation and also provides feedback on the initial blocks from the device (bottom left) in hexadecimal format. The EnCase user has the option to choose the format of the feedback they get. In the example here the table format has been chosen, but other formats – report or code – are also available.

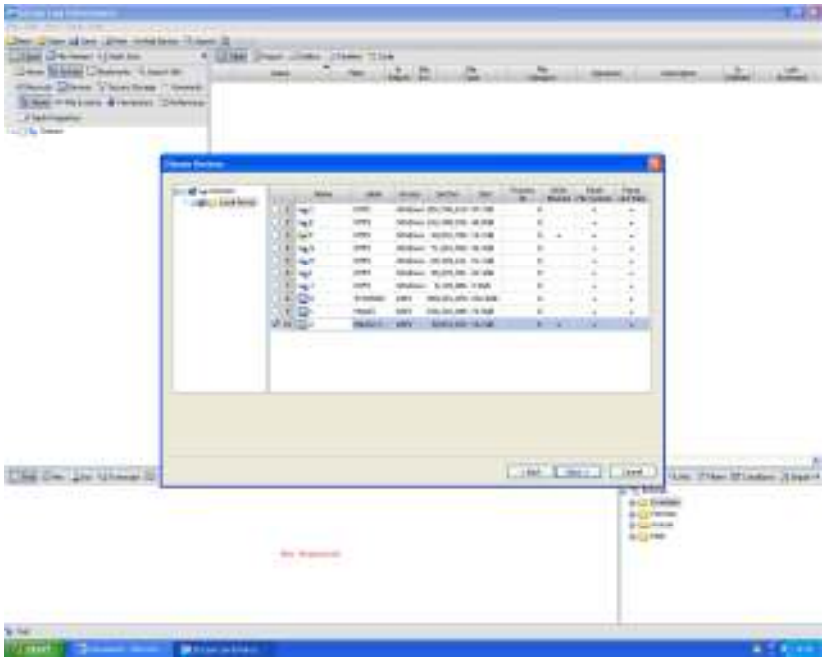


*Figure A.6 Feedback generated by EnCase © - Local Device Description*

In this example a breakdown of the local devices under investigation is illustrated. In this case there is no hexadecimal feedback, but the user has the extra option of presented the feedback in terms of a timeline.

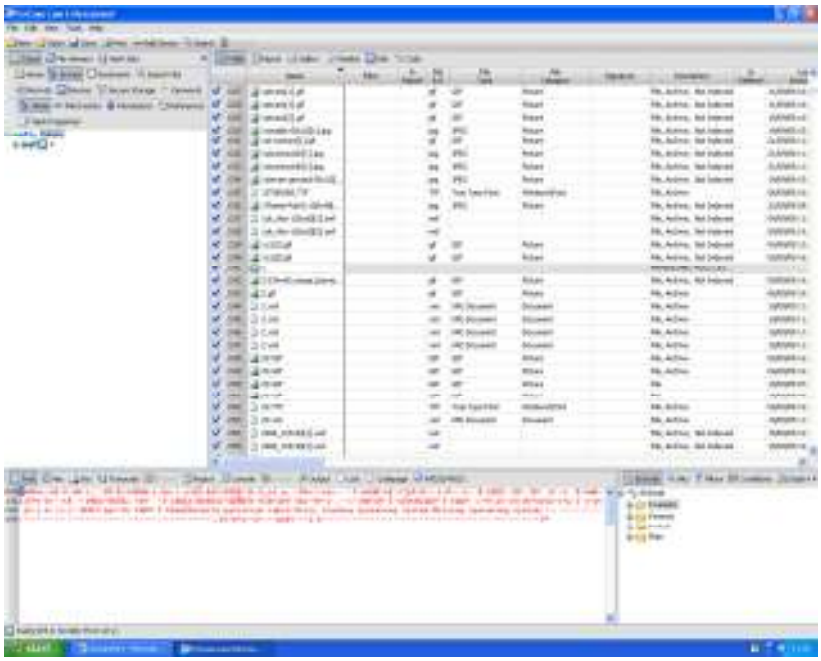


*Figure A.7 Feedback generated by EnCase © - File Entries on Device*

This example provides feedback on the file details held on the device under investigation and also provides information on the state of the files under investigation, indicating the likelihood of being able to recover those files.

*Figure A.8 Feedback generated by EnCase © - Gallery View of Device*

This final example from EnCase © shows the gallery view and provide pictorial feedback on any images held on the device under investigation.

Although the nature of the feedback is different, i.e. it does not come from a compiler and needs to be interpreted through the multiple windows on screen it nevertheless provides feedback and gets students used to the concept of looking for information generated by software as a result of their actions. As with the computer science students the computer forensics students did not perceive this

as feedback in that they would consider being a help to their learning, to quote one of the computer forensics students “its just information from the software”.

**Appendix 2 Questions used to Prompt Discussion and Responses**

**Discussion Group 1**

2005/06

Questions Posed

How did the feedback you received on your assessment help you ?

*"the important thing for me is the mark I get, it's the first thing I look for"* *

*"Yeah, the marks is what I look for, sometimes that's the only thing you get"*

*"I thought I'd done ok, but the mark was lower than I thought and it hit my confidence"* *

*"I looked at the comments, but only after I'd checked the mark".*

Did the feedback help you judge you level of understanding ?

*"The comments helped me see where I had gone wrong"*

*"I wish we'd had more detail on references and bibliography before I handed the assignment in"*

*"Don't know really"*

*"I still don't understand where I went wrong"*

Did the written feedback comments help you understand why you got the mark you did ?

*" a little bit, at least we got some written stuff back"*

*"not really, I get the comments but I still think I deserved a higher mark"*

*"I think that the comments made it clear for me"*

*"no"*

*"not sure that I understood the comments*

Will you use the feedback comments in future assessment tasks ?

*"don't know, maybe – maybe the stuff about references"*

*"I think so, I'm not sure really".*

2006/07

Questions Posed

How did the feedback you received on your assessment help you ?

*"it was difficult to give a good introductory overview of a subject in a strict word count without losing a lot of discussion about the subject material" **

*(Extra question)*

Did the criteria on the assessment help you plan your answers ?

*Yes, sort of, but there were so many things I wanted to write about.*

*(back to first question)*

"*helped me to see what was wanted" **

*"I think the feedback helped me understand what was expected from me".*

*"I was pleased with my mark and the feedback showed me where I'd got things right"*

*"I looked at the comments".*

Did the feedback help you judge you level of understanding ?

*"The comments helped me see where I had gone wrong"*

*"The Harvard comments were useful"*

*"I would have liked more explanation on what I'd done wrong"*

Did the written feedback comments help you understand why you got the mark you did ?

"*helped me to see what was wanted" **

*"yes – good to get the comments"*

*"yes – it made it clear for me"*

*"I couldn't read the writing"*

Will you use the feedback comments in future assessment tasks ?

*“don’t know, maybe – maybe the stuff about references”*

*“I’ll read the feedback before I start my next assessment”.*

2007/08

How did the feedback you received on your assessment help you ?

*“not sure”*

*“Yeah,I felt good when I got the marks back – I thought I’d done ok”*

*“the comments made the assessment clearer”*

Did the feedback help you judge you level of understanding ?

*“I wasn’t exactly sure what it was I was asked to do” **

*“I wasn’t sure what detail I was expected to go into, because the questions [the assignment specification] were different to what I’d had at college. I was pleased with the mark I got and the comments said I’d done ok” **

*“The comments helped me see where I had gone wrong”*

*“I wish we’d had more detail on references and bibliography before I handed the assignment in”*

*“Don’t know really”*

*“I still don’t understand where I went wrong”*

Did the written feedback comments help you understand why you got the mark you did ?

“*I did a lot of work on my assignment so I expect something back from my lecturer to show that he’s read it”*, *

*“good that we got some written feedback – sometimes we don’t even get the work back never mind comments”*

*“Not really”*

Will you use the feedback comments in future assessment tasks ?

*“yes – I think so”*

*“if the next assessment has the same sort of questions then yes”.*

**Discussion Group 2**

2006/07 Cohort

Was the mock exam a useful exercise ?

*“I didn’t like it – I didn’t have enough time to prepare”*

*“I was the same I didn’t have time to do any revision”*

*“It wasn’t fair to ask us to do that”*

Did the mock exam help you realise what was expected in the actual exam ?

*“it [the feedback] helped me understand the issues to think about in maintain evidential continuity” **

*“I thought it [the mock exam mark and feedback] was a good indicator of my current knowledge” **

Did the feedback on the mock exam change the way you tackled the actual exam ?

*“understanding what sort of questions might come up and getting more understanding of what to write” **

*“I used the comments from my mock exam to change the way I was writing up my case study notes in my lab book” **

*“the mark I got was less than I expected and it shows me that I need to work harder” **

Was it useful to get peer feedback ?

*“not really – want feedback from the lecturer”*

2007/08 Cohort

Was the mock exam a useful exercise ?

“*good to see what stage I am at and how much I still need to learn and work on” **

Did the mock exam help you realise what was expected in the actual exam ?

*“timing – I need to work out how long to give for answering each question and stick to it” **

“*next time I will take more time to understand the question” **

“*I thought great it can help me to know what to expect in the exam” **

*“this feedback was personalized and showed areas for improvement and areas of strength along with the mark achieved” **

*“the tutor tried to make sure we understood what they wanted for the answers, but I didn’t think it meant anything to me because I was happy with my mark” **

Did the feedback on the mock exam change the way you tackled the actual exam ?

*“getting feedback on the draft helped me to see where I had to do more work” **

*“getting feedback on the mock helped with my exam revision”*

“*I need to do more reading outside of lectures and seminars and go over my notes more” **

“*I need to back up my points with more examples and I need to consider more topics in my answers” **

*“feedback during a module, it’s useful to know where you are going with a piece of work before the module is finished. Most feedback is after a piece of work has been marked, some of this feedback is useful but, if it is topic specific, then in general it will never be considered again” **

Was it useful to get peer feedback ?

*“I’m not sure”*

*“I don’t think I know what suggestions to give”*

*“I didn’t like giving feedback to the other students and I didn’t think that the feedback back I got from the other groups was very helpful” **

**Discussion Group 3**

Questions posed

Look at the three examples of feedback

Can you rank them as to which is the most useful to which is the least useful ?

Why ?

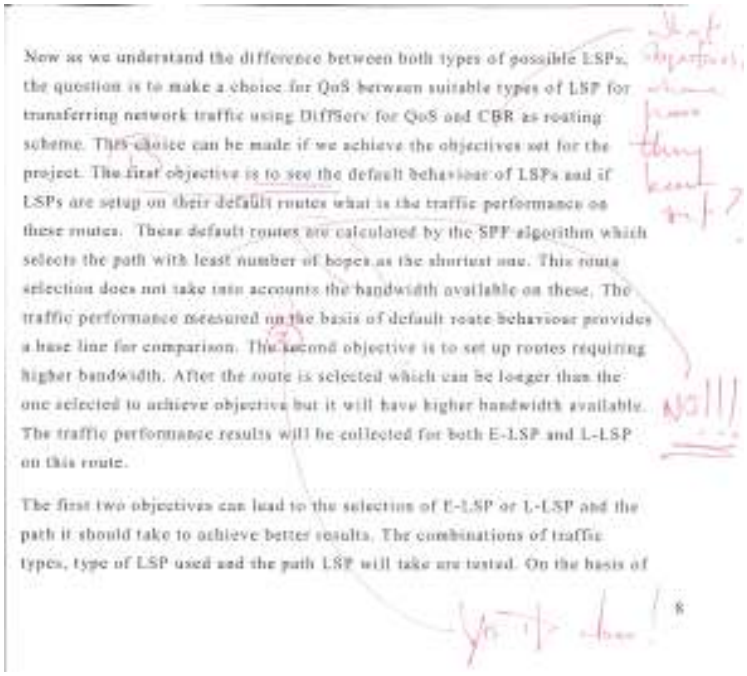
What is good about the top ranked

What is bad about the worst ?

**Appendix 3 Examples of Feedback Used in the Focus Groups**

PROVISIONAL GRADE AWARDED :

Figure A1 Feedback example 1 - front sheet comments



Now as we understand the difference between both types of possible LSPs, the question is to make a choice for QoS between suitable types of LSP for transferring network traffic using DiffServ for QoS and CBR as routing scheme. This choice can be made if we achieve the objectives set for the project. The first objective is to see the default behaviour of LSPs and if LSPs are setup on their default routes what is the traffic performance on these routes. These default routes are calculated by the SPF algorithm which selects the path with least number of hopes as the shortest one. This route selection does not take into accounts the bandwidth available on these. The traffic performance measured on the basis of default route behaviour provides a base line for comparison. The second objective is to set up routes requiring higher bandwidth. After the route is selected which can be longer than the one selected to achieve objective but it will have higher bandwidth available. The traffic performance results will be collected for both E-LSP and L-LSP on this route.

The first two objectives can lead to the selection of E-LSP or L-LSP and the path it should take to achieve better results. The combinations of traffic types, type of LSP used and the path LSP will take are tested. On the basis of

Figure A2 Feedback example 2 - annotated comments on script

Feedback on Assessment for CM0420 "Introduction to Computer Forensics" report – marks are awarded out of 50

You should make use of this feedback to reflect on what you have learned from undertaking the assignment and use the feedback as input (feed-forward) to other assessments on this module and the Computer Forensics course.

Student – Gareth Pinsow

Overall – some good work throughout your assignment report, well done. You have shown that you understand the basic ideas underpinning computer forensics and you have structured your report clearly in order to illustrate this understanding.

Take care when you are making your assertions that you make a clear statement about what you are actually stating, for example when you discuss "the growth in computing and computing use gives rise to the potential opportunity and potential vulnerability from computer crime" – it is not necessarily a direct correlation that increasing computers and networks will increase computer crime. The alternate approach is to substantiate your point or assertion with reference to the literature. for example Bloggs (200x) suggests in his review of computer crime that there is a "strong correlation between the increase in the numbers of opportunities to use computers and the growth in computer related crime".

In your bullet point section on threats (it is best to avoid bullet point approach in a report) you need to substantiate the claims that you make and/or indicate your sources.

Try to avoid broad statements like "many rules and guidelines" (page 3) and be specific, for example the ACPO Guidelines on Digital Evidence.

You could expand the coverage in your report by exploring other principles in computer forensics – especially around professional responsibility and liability. You could also go into more detail in your discussions on evidential continuity and integrity – perhaps illustrating with actual examples.

Your section on tools and techniques could go into a discussion on a broader range of products, specifically looking at different tools and techniques for different situations, environments and sources of digital evidence.

Please refer to "Cite them Right" to ensure that your referencing conforms to Harvard standards.

This is a solid piece of work and I hope that the feedback helps you in your future assessments. Well done. 34/50

Figure A3 Feedback Example 3 - Individualused feedback

**Appendix 4 Achievement Data**

Case Study 1

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Module | 57 | 60 | 54 | 47 | 54 | 48 | 65 | 63 | 45 | 54 | 51 | 58 | 61 | 51 | 72 | 60 | 44 | 46 | 55 |
| Level Ave | 55 | 54 | 55 | 42 | 50 | 52 | 66 | 60 | 48 | 52 | 50 | 58 | 60 | 48 | 70 | 58 | 46 | 44 | 54 |

*Summative scores for 2005/06 computer forensics students for unique module and overall level average*

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mod | 52 | 60 | 39 | 59 | 71 | 55 | 65 | 61 | 45 | 54 | 44 | 38 | 59 | 52 | 59 | 70 | 41 | 54 |
| Lev Av | 50 | 61 | 45 | 56 | 70- | 58 | 60 | 59 | 46 | 50 | 48 | 45 | 62 | 50 | 57 | 71 | 46 | 54 |

*Summative scores for 2005/06 computer science students for unique module and overall level average*

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mod | 55 | 66 | 60 | 40 | 71 | 50 | 42 | 46 | 65 | 50 | 55 | 51 | 40 | 70 | 60 | 63 |
| Lev Ave | 64 | 59 | 53 | 52 | 58 | 80 | 57 | 69 | 64 | 60 | 57 | 65 | 60 | 80 | 64 | 68 |

| Student | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mod | 51 | 46 | 43 | 42 | 57 | 54 | 60 | 61 | 56 | 47 | 50 | 44 | 78 | 54 |
| Lev Ave | 46 | 53 | 48 | 48 | 67 | 71 | 51 | 61 | 63 | 60 | 62 | 60 | 68 | 61 |

*Summative scores for 2006/07 computer forensics students for unique module and overall level average*

| Stdnt | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mod | 67 | 55 | 57 | 42 | 59 | 57 | 53 | 51 | 54 | 59 | 53 | 42 | 64 | 53 | 62 | 51 | 45 | 54 | 57 | 68 | 55 |
| Lev Av | 75 | 66 | 60 | 46 | 62 | 63 | 60 | 58 | 56 | 62 | 55 | 48 | 70 | 58 | 67 | 56 | 52 | 53 | 62 | 72 | 60 |

*Summative scores for 2005/06 computer science students for unique module and overall level average*

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mod | 67 | 12 | 45 | 65 | 62 | 64 | 53 | 56 | 63 | 58 | 63 | 53 | 64 | 53 | 63 | 51 | 34 | 52 |
| Lev Ave | 62 | 21 | 52 | 70 | 73 | 80 | 64 | 76 | 71 | 75 | 69 | 71 | 75 | 56 | 66 | 52 | 25 | 46 |

| Student | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mod | 56 | 62 | 57 | 53 | 53 | 52 | 56 | 56 | 56 | 60 | 52 | 48 | 60 | 47 | 50 | 57 | 56 | 55 |
| Lev Ave | 57 | 70 | 43 | 66 | 48 | 64 | 73 | 70 | 61 | 72 | 51 | 62 | 69 | 72 | 64 | 67 | 69 | 62 |

*Summative scores for 2007/08 computer forensics students for unique module and overall level average*

| Student | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 21 | 22 | 23 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mod | 64 | 35 | 60 | 57 | 60 | 58 | 60 | 68 | 76 | 71 | 70 | 71 | 70 | 76 | 62 | 53 | 62 | 62 | 73 | 64 |
| Lev Ave | 62 | 42 | 66 | 49 | 66 | 49 | 58 | 65 | 80 | 61 | 78 | 74 | 77 | 83 | 65 | 28 | 66 | 56 | 71 | 63 |

*Summative scores for 2007/08 computer science students for unique module and overall level average*

Case Study 2

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mock | 62 | 20 | 22 | 42 | 60 | 48 | 42 | 12 | 36 | 40 | 60 | 56 |
| Exam | 60 | 27 | 0 | 51 | 73 | 63 | 55 | 17 | 43 | 35 | 73 | 61 |
| Diff | -2 | 7 | -22 | 9 | 13 | 15 | 13 | 5 | 7 | -5 | 13 | 5 |

| Student | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mock | 40 | 45 | 17 | 22 | 12 | 46 | 40 | 32 | 34 | 38 | 38 |
| Exam | 35 | 52 | 31 | 23 | 0 | 56 | 52 | 41 | 41 | 45 | 42 |
| Diff | -5 | 7 | 14 | 1 | -12 | 10 | 12 | 9 | 7 | 7 | 5 |

*Computer Forensics Year 2 (2006/07) mock exam performance comparison with exam performance*

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mock | 60 | 40 | 40 | 60 | 0 | 80 | 0 | 8 | 64 | 36 | 24 | 24 | 28 | 28 | 48 | 36 | 44 | 0 |
| Exam | 48 | 44 | 44 | 58 | 50 | 68 | 48 | 20 | 60 | 42 | 58 | 40 | 40 | 44 | 50 | 46 | 40 | 45 |
| Diff | -12 | 4 | 4 | -2 | 50 | -12 | 48 | 12 | -4 | 6 | 34 | 16 | 12 | 16 | 2 | 10 | -4 | 45 |

| Student | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mock | 40 | 36 | 68 | 28 | 60 | 52 | 44 | 48 | 48 | 20 | 60 | 0 | 24 | 0 | 60 | 64 | 37 |
| Exam | 16 | 40 | 70 | 32 | 58 | 50 | 38 | 58 | 54 | 28 | 62 | 30 | 32 | 0 | 58 | 60 | 45 |
| Diff | -24 | 4 | 2 | 4 | -2 | -2 | -6 | 10 | 6 | 8 | 2 | 30 | 8 | 0 | -2 | -4 | 8 |

*Computer Forensics Year 2 (2007/08) mock exam performance comparison with exam performance*

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CM0541 Mark | 62 | 28 | 0 | 49 | 73 | 65 | 58 | 20 | 48 | 40 | 70 | 64 | 41 | 52 | 38 |
| CM0542 Mark | 68 | 30 | 0 | 45 | 70 | 68 | 54 | 30 | 52 | 44 | 72 | 66 | 48 | 50 | 30 |

| Student | 16 | 17 | 18 | 19 | 20 | 21 | 22 | Ave |
|---|---|---|---|---|---|---|---|---|
| CM0541 Mark | 30 | 0 | 58 | 50 | 40 | 45 | 48 | **49** |
| CM0542 Mark | 36 | 0 | 56 | 62 | 50 | 52 | 52 | **52** |

*2006/07 Comparison of Computer Forensics Modules*

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CM0541 Mark | 48 | 48 | 48 | 55 | 53 | 65 | 53 | 32 | 55 | 42 | 63 | 47 | 47 | 50 | 47 | 53 | 48 | 53 |
| CM0542 Mark | 66 | 61 | 56 | 44 | 55 | 66 | 50 | 53 | 52 | 46 | 50 | 62 | 61 | 60 | 84 | 50 | 40 | 50 |

| Student | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CM0541 Mark | 8 | 47 | 72 | 37 | 54 | 50 | 36 | 60 | 56 | 32 | 60 | 41 | 47 | 0 | 51 | 56 | **47** |
| CM0542 Mark | 0 | 41 | 62 | 46 | 40 | 65 | 50 | 67 | 50 | 37 | 54 | 68 | 60 | 0 | 45 | 63 | **52** |

*2007/08 Comparison of computer forensics modules*

| Student | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 18 | 19 | 20 | 21 | 22 | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CM0541 Adjusted** | 64 | 29 | 47 | 73 | 67 | 61 | 23 | 53 | 45 | 67 | 67 | 47 | 52 | 45 | 37 | 60 | 48 | 39 | 49 | 51 | **51** |
| **CM0542 Mark** | 68 | 30 | 45 | 70 | 68 | 54 | 30 | 52 | 44 | 72 | 66 | 48 | 50 | 30 | 36 | 56 | 62 | 50 | 52 | 52 | **52** |

*2006/07 Comparison of Computer Forensics Modules – with CM0541 adjusted*

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CM0541 Adjusted** | 48 | 52 | 52 | 52 | 56 | 62 | 58 | 44 | 50 | 42 | 68 | 54 | 54 | 56 | 44 | 60 | 56 | 61 |
| **CM0542 Mark** | 66 | 61 | 56 | 44 | 55 | 66 | 50 | 53 | 52 | 46 | 50 | 62 | 61 | 60 | 84 | 50 | 40 | 50 |

| Student | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 33 | 34 | AVE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CM0541 Mark** | 54 | 74 | 42 | 50 | 50 | 34 | 62 | 58 | 36 | 58 | 52 | 62 | 44 | 52 | **51** |
| **CM0542 Mark** | 41 | 62 | 46 | 40 | 65 | 50 | 67 | 50 | 37 | 54 | 68 | 60 | 45 | 63 | **52** |

*2007/08 Comparison of Computer Forensics Modules – with CM0541 adjusted*